



URANOSCOPIA

Or, the Contemplation of the

HEAVENS, &c.



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URANOSCOPIA:

OR, THE

Contemplation of the Heavens.

BEING A

Demonstration of the Equation of Time.

With the

Method of observing the Solar Ingresses into any Point of the Ecliptic ; and the Investigation of the Aphelions, and Eccentricities of the Planets.

The Determination of the greatest Elongation of VENUS and MERCURY from the SUN.

Of the Mean Motion of the Earth, her Aphelion, and the Recession of the Equinox ; the SUN and MOON'S True and Apparent Places, by Calculation and Observation : With the true Hour of the Night, by the STARS ; perform'd by a New Quadrant.

Also, an Explanation and Demonstration of the Keplerian and Flamsteedian Methods of Computing the Times, and principal Appearances of Solar Eclipses. To which are added, New Tables of the Nonagesime Degree, its Altitude ; the Moon's Parallax in Altitude, Longitude and Latitude. With many other things useful for such a Work.

By **CHARLES LEADBETTER**, Teacher of the
Mathematicks. K

L O N D O N,

Printed for **J. WILCOX** at *Virgil's Head*, against the
New Church in the Strand. **MDCCXXXV.**

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tion: With the Light of the STARS.



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T H E
INTRODUCTION.

READER,



Here present you with what I promised in the 418th Page of my *Compleat System of ASTRONOMY*; that is, the method of Computing the Latitudes and Longitudes of the Places of the Globe where the principal Appearances of Solar Eclipses are Visible.

And, as it was the Great *Kepler* that first made use of this method; so it was our Country-man Mr. *Flamsteed* that took it into consideration and improved it: But because the former wrote in *Latin*, and the latter giving but only one short Example, and that Book is become scarce and consequently dear, I have therefore in the following Sheets endeavoured to explain both their Methods in divers Examples.

And as the times of the Universal Eclipses are first to be had before you can proceed to find where the principal Appearances are seen; these must be Learned from the 17th Precept of my forecited Book; in which you are to observe, that the time of the Ecliptic Conjunction, is always
equal

equal to the time that the Sun is Centrally Eclipsed in the Nonagesime Degree ; which you may the better understand by carefully tracing the following Calculations.

And as this Method of Projecting Solar Eclipses, and the Passage of the *Penumbra* over the Earth's Disk, I have sufficiently explain'd in the 419th Page of my SYSTEM ; yet it will not be impertinent to acquaint the Reader (in this place) that, if we imagine a Plane to pass thro' the Center of the Earth, so that the Line which joyns the Centers of the Sun and Earth, may be perpendicular to this Plane, it will make on the Surface of the Earth a Circle, which will separate the illuminated Hemisphere of the Earth from the Dark.

This Circle is called the *illuminated Disk* ; which Disk is directly seen by a Spectator placed at the distance of the Moon, in the right Line which joyns the Centers of the Sun and Earth.

Upon this Circle the Earth's Equator, its Parallels, Poles, and all other Circles which we imagine, are to be supposed Projected Orthographically : For all Lines drawn from the Center of the Sun to every single Point of the Disk being perpendicular to it, all the rest will be perpendicular to it ; and then an Observer in the Moon will see all Countries, Cities, and Towns to move upon the Disk, which is occasioned by the Rotation of the Earth round its Axis from West to East : And every Point will have its way on the Disk : For by the Diurnal Gyration, all Places describe either the Equator, or one of its Parallels ; and if the Sun be in the Plane of the Equinoctial, or rather if the Plane of the Equinoctial pass thro' the Sun, the Equi-

Equinoctial and all its Parallels are in that case projected into Right Lines: For they will all be Perpendicular to the Disk, or Plane of the Projection.

But in other Positions of the Earth, or Sun, the Projection of these Circles will be Ellipses, which is the way that all the Places of the Earth are seen to move on the Disk.

Now, if thro' the Pole and the Sun there be a great Circle drawn which cuts the Earth, and this Circle be Projected on the Disk, it will be the Universal Meridian, (as in the three following general Schemes is Noted with $\odot$ being the Earth's Axis.) To which, when any Place is observed to come, the Inhabitants of that Place will have Mid-day. And when any Place is seen to touch the Western Limb, or Edge of the Disk, the Inhabitants of that Place will then see the Sun rising to them; but a Spectator at the Moon will see the Place to rise and come upon the Disk, and will see it move towards the East: (because the Eye at the Moon is carried that way) and as soon as it has pass'd the Universal Meridian, the Place then being gone to the Eastward, the Sun seen out of the Earth from the place will appear to move Westward. But when the place comes to the Eastern edge of the Disk, the Spectator in the Moon will observe the Place to set in the Disk; but the Inhabitants of that place upon the Earth's Surface will see the Sun to set in the West.

These being the chief Properties of this Projection, I shall hereunto subjoyn the twelve Propositions of *Theodosius*, which will give great light into the *Keplerian Method*.

PROPOSITION I.

To those that inhabit under the North Pole, one and the same Hemisphere of the World is always apparent ; but the other Hemisphere is always hidden : Nor do any Stars, either rise or set to them ; but those that are in the upper Hemisphere are always conspicuous, and contrarily those in that, which is hidden, never appear.

II. To those People that inhabit under the Equinoctial Circle, all the Stars do rise and set ; and are moved in equal time of 12 Hours above the Horizon, and under it.

III. In every Place within the Middle, or Torrid Zone, the Ecliptic Circle is at some certain time of the Day at right Angles to the Horizon of the Place : For the Circle parallel to the Equator, drawn thro' the *Vertex* or Zenith of the place, cuts the Ecliptic Circle in two Points. When therefore the Point of either Intersection is co-unityed with the Zenith, then the Ecliptic passes thro' the Poles of the Horizon ; and therefore it cuts the Horizon at right Angles ; and this is done twice in one Diurnal Revolution. But to those inhabiting under either Tropick, only once in a Day, that is, when the Solstitial Points in which the Ecliptic touches both the Tropicks come to the Zenith of that place. See the Table of the Altitude of the Nonagesime Degree. This is made Plain.

IV. To

IV. To those whose Zenith is as far distant from the Pole, as the Tropicks from the Equator, six Signs shall at once happen to rise, and six to set, in one Diurnal Revolution; that is, to those whose Zenith is in the Artic or Antartic Circle. For whereas the Poles of the Ecliptic are carried in the Peripheries of those Circles, therefore in one Diurnal Revolution the Pole is once co-united with the Zenith; that is, the Pole of the Ecliptic with the Pole of the Horizon; and therefore, the Ecliptic is also co-united with the Horizon. Which Co-union is made in an instant; and after that instant the Ecliptic is forthwith divided into two parts by the Horizon: So that in an instant one Semicircle of the Ecliptic rises, and the other Semicircle sets.

V. To those People inhabiting under the Equinoctical Circle, the Meridian shall cut above the Horizon the Semicircle of the Ecliptic into two equal parts, when the Points of Contact of the Tropicks and Ecliptic come to be in the Horizon; and then also the Ecliptic shall be at right Angles to the Horizon.

For, the Horizon then passing thro' the Poles of the Tropick, (the same with the Poles of the World) and the Points of the Contact of the Tropicks and Ecliptic shall (by the Laws of Sphericks) pass likewise thro' the Poles of the Ecliptic; and therefore shall cut the same at right Angles: And likewise the Ecliptic pass thro' the Poles of the Horizon, by which the Meridian also passes.

From whence the Arches, as well of the Meridian, as of the Ecliptic, intercepted between the Pole of the Horizon, and the Horizon, are Quadrants.

VI. To those Inhabiting under the Equinoctial, all Semicircles of the Ecliptic arise in equal time, as likewise do their opposite Peripheries.

For there, every Semicircle of the Ecliptic arises with the Diurnal Arch of its beginning; (but by the second hereof) all the Diurnal Arches are Semicircles, by which is manifest, the first part of this Proposition: The other part is clear, seeing not only the opposite Peripheries of the Ecliptic, but those likewise equally distant from the Equinoctial Points ascend, with equal Arches of the Equinoctial.

VII. To those People whose Horizon differ by a more Easterly Position, the Stars neither arise together, nor set together; but by how much sooner they arise to those who live more Easterly, by so much sooner do they set: For the Horizons of such equal Places, by reason of equal Altitude of the Pole, touch the same Parallel of the Equator; wherefore the Arch from any Parallel of the Semicircle of the Horizon interjected, as well between the places Eastward, as those Westward, are the same. Therefore every Star in a place Eastward by the same Arch, anticipates its rising, and thence its Setting, and consequently in the same interval of time.

VIII. To

VIII. To those inhabiting under the same Meridian, whatever Stars are between the greatest of the always apparent Parallels and the Equinoctial, appear longer above the Horizon to those inhabiting Northward, than they do to those inhabiting Southward.

And how much sooner they arise to those inhabiting Northward, so much later they set. But those Stars which are between the greatest of the Parallels always latent, (or hid) and the Equinoctial, appear longer above the Horizon, to those inhabiting Southward, than they do to those inhabiting Northward; and how much sooner they rise to those inhabiting, so much later they set.

For to one travelling towards the apparent Pole, the Diurnal, increases; and to one going towards the Pole that is depressed, the Diurnal Arch of a Star, declining thitherward, increases likewise: But by Collating the Arches increasing on either side, that is to say, towards the East, or towards the West, the rest of the Proposition is manifest.

IX. But if the Horizons be neither under one Parallel, nor under the same Meridian, there will follow only an Inequality of the Arches raised above the Horizon, after the manner as before expressed; but no Anticipation of Risings or Settings. This, as the premised, is manifest by reason of the greater or lesser Inclination of the Horizon.

X. To those Inhabitants under either Pole, the Sun is carried constantly for six Months (nearly above the Horizon, and as long underneath it.

This appears by the first Proposition, since one half of the Ecliptic is always apparent, and the other always latent; either of which by the Sun (apparently) in near about six Months time, is run through.

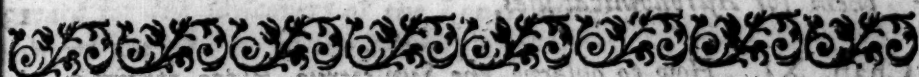
XI. To those going from the Pole towards the Artic or Antartic Circles, this constant Stay of the Sun either above or under the Horizon, for six Months, grows lesser and lesser, until it be reduced to the space of 24 Hours, either under the Artic or Antartic Circle: For, the Horizon of those Habitations, touch two Parallels of the Equator greater than the Tropicks, which on either side cut from the Eliptic two equal Peripheries; and that Periphery which the Parallels always cut off, never sets, and that which is always latent, never rises. Latent, always signifies *hid*.

To those inhabiting under the Artic or Antartic Circles, the longest Day is 24 Hours, and the Night but an instant; on the contrary, the longest Night 24 Hours, and the Day but an instant.

The other Arks increase and decrease until they come to the Equality of the Equinox.

22 JUL 63

T H E



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ADVERTISEMENT.

 **T**HE Author hereof, teacheth Astronomy in all its Parts ; with Navigation, Surveying, Gauging, and Dialling, at his House, at the *Hand and Pen in Cock-Lane, Shore-Ditch, London.*

Any Persons that write to him out of the Country about their own Business, are desired to pay the Postage of their Letters ; otherwise they may expect no Answer.

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ERRATA.

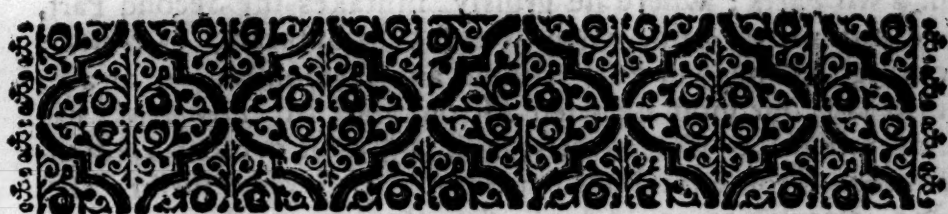
Page 34, for *Sum*, read *Sun*; p. 55, Line *ult.* r. *half*;
 p. 60. l. 9, for 22, r. 23; p. 64, l. 12, for 549, r. 459;
 p. 77, l. 22, for 36, r. 35; p. 90, l. 4, r. for 1724, r. 1734;
 and under *Apog.* for 3⁹, r. 8; p. 118, l. *ult.* r. *Sign* 11; and for
 14, r. 4; p. 120, l. *ult.* for 5, r., 4 and 3 *Sign* under 9, for Page
 86, r. 186; p. 281, l. 36, for *Gard*, r. *Card*; p. 304, before 6,
 under the black Line. CHAP. 22; p. 552, l. 4, for *Parallax*
 r. *Parallax*.

THE Author heretofore, teacheth Astronomy in
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22 JY 63

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URANOSCOPIA.

CHAP. I.

A Demonstration of the Equation of Time.



BEING now upon the Business of Demonstrating my Astronomical Observations, it will not be improper to speak something of the Inequality of Natural Days: For without a right understanding in that, the Astronomer will be at a loss to regulate his curious Time-keeper, and thereby make wrong Observation. This is a Matter that has exercis'd the Thoughts of Astronomers in all Ages: And tho' all have allow'd, that there really is such an Inequality, yet they have much disagreed in assigning its Quantity, and demonstrating the Reason and Affection thereof; because they all built upon a wrong Hypothesis, supposing the Earth at rest; which produced them but one part of the Equation of Natural Days: And with this they satisfied themselves, not thinking but that they then had the whole, whereas they had only one half.

Thus, the Equation of Time, which depends upon the Obliquity of the Ecliptic, was made use of till about the Middle of the last Century, when our Country-Man *Street*, in his Ephemeris for the Year 1655, gave a little Skerch of its Demonstration, which he afterwards put in his *A-*

Astronomia Carolina, with Tables of the Equation of Time, in Two Parts; where he grossly mistakes the Second Part, and bids us to Add, when we should Subtract, & *contra*; leaving the Second Part without any Demonstration at all; till at last, our most Learned Astronomer Mr. *Flamsteed*, has determin'd the Controversy, and by most evident Demonstrations Geometrical has put the matter beyond further Dispute, clearly evincing both the Reasons, Affections, and Quantity of this Inequality. His Dissertation concerning this, is annex'd, and publish'd at the End of the *Opera Posthuma Jeremie Horroxcii*, Lond. 1673, 4to. to which I refer my Reader.

Let us now, with Dr. *Keill*, ask who they are that dare tell us, that the Sun doth not tell the Truth? The Astronomers are the bold Men that tell us so: For they, by their nice Search into Things, have found, that the Sun's apparent Motion is no ways equal: They observe, that he now and then slackens his pace, and afterwards quickens it again: And therefore Equal Time, which goes on always at the same rate, cannot truly be measur'd by the Sun's Motion. *Keill*, *Lect.* Page 313. Astronomers have distinguish'd the Days into Civil and Natural.

1. A Civil Day being that Space of Time containing just twenty four Hours, reckon'd from Twelve of the Clock at Noon on one day, unto Twelve of the Clock at Noon on the next day; in which time the Equinoctial makes one entire Revolution about the Axis of the World.

2. The Natural, or Apparent Day, is that Space of Time, in which the Sun moves from the Meridian of one Place, to the same Meridian again. These Days are not always of an equal Length; but are longer at some times of the Year than at other times. The difference between these two sorts of Days is but small; and there is a double Cause for this small Inequality.

All Astronomical Time begins at the Noon of one day, and ends at Noon on the next following day; and this agrees with the *Natural Day* above-mention'd.

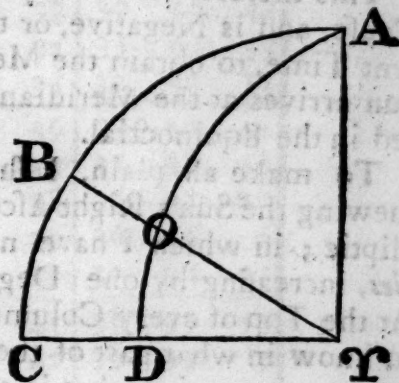
This has also two Demonstrations, *viz.* Equal and Apparent.

The Equal Time is that which is kept by an equal Motion in the Equinoctial; to which Time all Astronomical Tables are exhibited.

The

The Apparent Motion, or Time Apparent, is the sensible or external Measure, estimated by the Sun's Apparent unequal Motion in the Ecliptic; to which, all Calculations Astronomical must be reduced.

In this adjacent *Diagram*, let $A B C$ be a Quadrant of the Solstitial Colure, A the Pole, γC a Radius of the Equinoctial, γB a Radius of the Ecliptic, γ the Equinoctial Point, or the Place of the Sun in the Beginning of it at Noon on some certain day, $\odot$ the Sun's Place at Noon the day following; through which Place strike the Arch $A \odot D$, to cut the Equinoctial at Right Angles in D : $\gamma \odot$ will express the diurnal Motion of the Sun, and γD its Right Ascension, or the Equinoctial that culminates with the Sun: which Arch, seeing it is one of the Sides of a Right-angled Spheric Triangle $\gamma D \odot$, cannot be equal to the Hypothenuse, that is, to the Sun's Motion $\gamma \odot$.



Wherefore seeing the Revolutions of the Equinoctial, and of its equal or like Parts, are equable, and performed in equal times; but the Sun, in passing equal Parts of the Ecliptic, apply to the Meridian with unequal Parts of the Equinoctial; it necessarily follows, that the Solar Days are unequal.

And that the difference between the Sun's true Place and its Right Ascension, being converted into Time, is the true Equation of Time arising from this Cause. Which Equation in the first and third Quadrants of the Ecliptic is to be subtracted from the Apparent Time: For in them the Longitude of the Sun from the next Equinoctial Point passes the Meridian sooner than a like Arch projected in the Equinoctial. But in the second and fourth Quadrants of the Ecliptic, this Equation is to be added to the Apparent Time to get the Mean; for in these the Longitude of the Sun from the Equinoctial Point *Libra* passes the Meridian later than the like Arch projected in the Equator.

For Example: Let the Longitude of the Sun from the Equinoctial Point γ be $\gamma \odot = 59^{\circ} 8''$, its Right Ascension, or the Arch of the Equinoctial culminating therewith will

be $\gamma D 54' 14''$, being less than $\gamma \odot$ by $4' 54''$; which being turned into Time (by the Table, Page 66, of my Astronomy) is $19'' 36'''$; and by so much is the Apparent Day shorter than the Mean.

This therefore is the Equation of Time arising from this Cause, and is Negative, or to be subtracted from the Apparent Time, to obtain the Mean Time: For the Longitude of Sun arrives at the Meridian sooner than a like Arch projected in the Equinoctial.

To make all plain, I shall annex the following Table, shewing the Sun's Right Ascension to every Degree of the Ecliptic; in which I have number'd the Sun's Place from *Aries*, increasing by one Degree round the Ecliptic, to 360° . At the Top of every Column I have set the Signs, for a Guide to know in what part of the Ecliptic the Sun is: By which you may perceive, that in the first Quadrant, that is, all the time the Sun's Place is less than 90° , the Sun's Place exceeds the Right Ascension; but in the second Quadrant, that is, while he is moving from *Cancer* to *Libra*, his Place being less than 180° , the Right Ascension is more than the Sun's Place. In the third Quadrant, the Longitude is again greater than the Right Ascension; but in the 4th or last Quadrant it is again less, as in the second.

Now it is from this Table that I constructed that in Page 2, of my Astronomy. Thus, let the Sun be one Degree in *Aries*, his Right Ascension is $55' 4''$; which subtracted from 1° , leaves $4' 58''$; which turned into Time, is $19'' 52'''$. Now because I omit Thirds in that Table, therefore I call $19'' 52''' : 20''$, which is the first Number in that Table of the first Part of the Equation of Time, to be added to the Equal, or subtracted from the Apparent Time. Again, let the Sun be in 15° *Taurus*; that is, 45° from the beginning of *Aries*, and his Right Ascension is $42^\circ 31' 34''$; this difference is $2^\circ 28' 26''$; which reduced into Time, is $9' 53'' 44'''$, to be added to the Equal, or subtracted from the Apparent Time, as that Table directs, which was constructed from this, after the manner now directed.

URANOSCOPIA.

Sun's Place	R. Ascension ° ' "	Sun's Place	R. Ascension ° ' "
1	0 55 2	31	28 51 32
2	1 50 4	32	29 49 3
3	2 45 7	33	30 46 44
4	3 40 10	34	31 44 33
5	4 35 15	35	32 42 32
6	5 30 22	36	33 40 41
7	6 25 31	37	34 38 59
8	7 20 42	38	35 37 28
9	8 15 55	39	36 36 6
10	9 11 11	40	37 34 55
11	10 6 30	41	38 33 54
12	11 1 53	42	39 33 3
13	11 57 20	43	40 32 22
14	12 52 51	44	41 31 53
15	13 48 26	45	42 31 34
16	14 44 6	46	43 31 26
17	15 39 51	47	44 31 29
18	16 35 40	48	45 31 43
19	17 31 35	49	46 32 7
20	18 27 36	50	47 32 42
21	19 23 44	51	48 33 30
22	20 19 58	52	49 34 28
23	21 16 18	53	50 35 36
24	22 12 46	54	51 36 55
25	23 9 20	55	52 38 25
26	24 6 2	56	53 40 6
27	25 2 52	57	54 41 58
28	25 59 49	58	55 44 0
29	26 56 55	59	56 46 13
30	27 54 19	60	57 48 36

URANOSCOPIA.

Sun's Place	R. Ascension				Sun's Place.	R. Ascension			
	o	'	"	'''		o	'	"	'''
61	58	51	09		91	91	0	51	25
62	59	53	52		92	92	1	10	50
63	60	56	40		93	93	2	16	14
64	61	59	49		94	94	3	21	36
65	62	3	1		95	95	4	25	56
66	64	6	23		96	96	5	32	15
67	65	9	54		97	97	6	37	30
68	66	13	33		98	98	7	42	43
69	67	17	21		99	99	8	47	55
70	68	21	18		100	100	9	52	57
71	69	25	22		101	101	10	57	57
72	70	29	33		102	102	11	2	53
73	71	33	53		103	103	12	7	44
74	72	38	19		104	104	13	12	29
75	73	42	52		105	105	14	17	8
76	74	47	31		106	106	15	21	21
77	75	52	16		107	107	16	26	7
78	76	57	7		108	108	17	30	27
79	78	2	3		109	109	18	34	38
80	79	7	3		110	110	19	38	42
81	80	12	8		111	111	20	42	39
82	81	17	17		112	112	21	46	27
83	82	22	30		113	113	22	50	6
84	83	27	45		114	114	23	53	37
85	84	33	4		115	115	24	56	50
86	85	38	24		116	116	25	0	11
87	86	43	46		117	117	26	3	14
88	87	49	10		118	118	27	6	8
89	88	54	35		119	119	28	8	51
90	90	00	00		120	120	29	11	24

Sun's

Sun's Place.	R. Ascension			Sun's Place.	R. Ascension		
	°	'	"		°	'	"
121	123	13	47	151	153	3	5
122	124	16	0	152	154	0	11
123	125	18	2	153	154	57	8
124	126	19	54	154	155	53	58
125	127	21	35	155	156	50	40
126	128	23	5	156	157	47	14
127	129	24	24	157	158	43	42
128	130	25	32	158	159	40	2
129	131	26	30	159	160	36	16
130	132	27	17	160	161	32	24
131	133	27	53	161	162	28	25
132	134	28	17	162	163	24	20
133	135	28	31	163	164	20	9
134	136	28	33	164	165	15	54
135	137	28	29	165	166	11	34
136	138	28	7	166	167	7	9
137	139	27	38	167	168	2	40
138	140	26	57	168	168	58	7
139	141	26	6	179	169	53	30
140	142	25	5	170	170	48	49
141	143	23	54	171	171	44	3
142	144	22	32	172	172	39	18
143	145	21	1	173	173	34	29
144	146	19	19	174	174	29	38
145	147	17	28	175	175	24	45
146	148	15	27	176	176	19	50
147	149	13	16	177	177	14	53
148	150	10	57	178	178	9	56
149	151	8	28	179	179	4	58
150	152	5	51	180	180	0	0

Sun's Place.	R. Ascension.			Sun's Place.	R. Ascension.		
	°	'	"		°	'	"
181	180	55	2	211	208	51	32
182	181	50	4	212	209	49	3
183	182	45	7	213	210	46	44
184	183	40	10	214	211	44	33
185	184	35	15	215	212	42	32
186	185	30	22	216	213	40	41
187	186	25	31	217	214	38	59
188	187	20	42	218	215	37	28
189	188	15	55	219	216	36	6
190	189	11	11	220	217	34	55
191	190	6	30	221	218	33	54
192	191	1	53	222	219	33	3
193	191	57	20	223	220	32	22
194	192	52	51	224	221	31	53
195	193	48	26	225	222	31	24
196	194	44	6	226	223	31	26
197	195	39	51	227	224	31	29
198	196	35	40	228	225	31	43
199	197	31	35	229	226	32	7
200	198	27	36	230	227	32	43
201	199	23	44	231	228	33	30
202	200	19	58	232	229	34	28
203	201	16	18	233	230	35	36
204	202	12	46	234	231	36	55
205	203	9	20	235	232	38	25
206	204	6	2	236	233	40	6
207	205	2	52	237	234	41	58
208	205	59	49	238	235	44	0
209	206	56	55	239	236	46	16
210	207	54	9	240	237	48	36

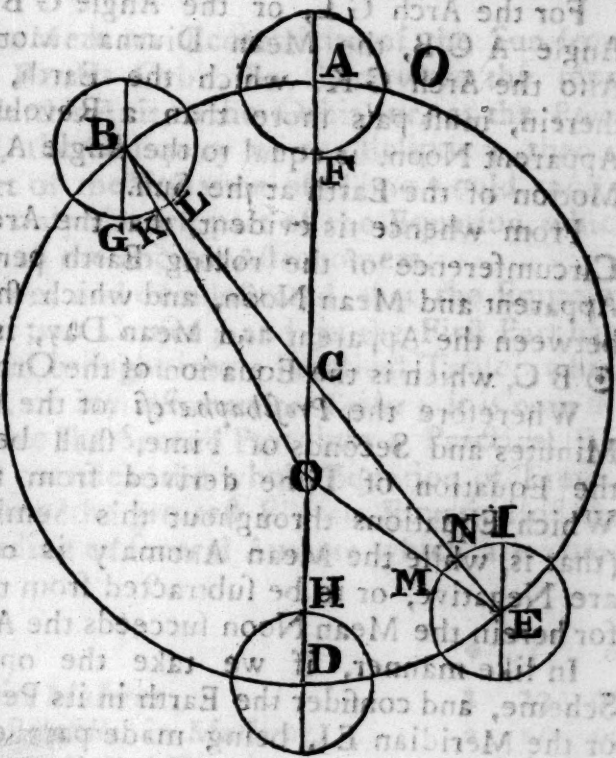
Sun's Place.	R. Ascension.			Sun's Place.	R. Ascension.		
	°	'	"		°	'	"
241	238	51	9	271	271	5	25
242	239	53	52	272	272	10	50
243	240	56	36	273	273	16	14
244	241	59	49	274	274	21	36
245	243	3	1	275	275	26	56
246	244	6	23	276	276	32	15
247	245	9	54	277	277	37	30
248	246	13	33	278	278	42	43
249	247	17	21	279	279	47	52
250	248	21	18	280	280	52	57
251	249	25	22	281	281	57	57
252	250	29	33	282	283	2	53
253	251	33	53	283	284	7	44
254	252	38	19	284	285	12	29
255	253	42	52	285	286	17	8
256	254	47	31	286	287	21	21
257	255	52	16	287	288	26	7
258	256	57	7	288	289	30	27
259	258	2	3	289	290	34	38
260	259	7	3	290	291	38	42
261	260	12	8	291	292	42	39
262	261	17	17	292	292	46	27
263	262	22	30	293	294	50	6
264	263	27	45	294	295	53	37
265	264	33	4	295	296	56	59
266	265	38	24	296	298	0	11
267	266	43	46	297	299	3	14
268	267	49	10	298	300	6	8
269	268	54	35	299	301	8	51
270	270	0	0	300	302	11	24

Sun's Place.	R. Ascension.			Sun's Place.	R. Ascension.		
	°	'	"		°	'	"
301	302	13	47	331	333	3	5
302	304	16	0	332	334	0	11
303	305	18	2	333	334	57	8
304	306	19	54	334	335	53	58
305	307	21	35	335	336	50	30
306	308	23	5	336	337	47	14
307	309	24	24	337	338	43	42
308	310	25	32	338	339	40	2
309	311	26	30	339	340	36	16
310	312	27	17	340	341	32	24
311	313	27	53	341	342	28	25
312	314	28	17	342	343	24	20
313	315	28	31	343	344	20	9
314	316	28	34	344	345	15	54
315	317	28	26	345	346	11	34
316	318	28	7	346	347	7	9
317	319	27	38	347	348	2	40
318	320	26	57	348	348	58	7
319	321	26	6	349	349	53	30
320	322	25	5	350	350	48	49
321	323	23	54	351	351	44	5
322	324	22	32	352	352	39	18
323	325	21	1	353	353	34	29
324	326	19	19	354	354	29	38
325	327	17	28	355	355	24	45
326	328	15	27	356	356	19	50
327	329	13	16	357	357	14	53
328	330	10	57	358	358	9	56
329	331	8	27	359	359	4	58
330	332	5	51	360	360	0	0

On

On account of the Sun's Eccentricity, C $\odot$ 1692, from the Center of the Earth's Annual Orbit, the Diurnal Motion of the Earth is sometimes faster, and sometimes slower than the Mean Motion $59' 8''$; and consequently the Apparent Day is sometimes longer, and sometimes shorter than the Mean Day: Which Inequality, and the quantity of the Difference of the Equal or Mean Day from the Apparent, is thus demonstrated:

In the following Figure, let A B D E be the Great Orb, in which the Earth is yearly carried about the Sun; the Center hereof is C, A, the Aphelion, or the Earth's Place at Noon on that Day that it is in its Aphelion, suppose the 18th of June, B the Earth's Place at Noon the following Day; A F an assigned Meridian of the Earth; the Arch A B, or the Angle A C B; the Mean Motion of the Earth $59' 8''$ from the Noon of the given Day, to the Noon of the Day following; F a Point in the given Meridian turn'd to the Sun; which Point while the Earth is carried in its Orb from A to B, is roll'd by the diurnal Circumvolution of the Earth from F thro' O the first Day, to G the second Day; to which Place when the said Point arrives, 'tis manifest that the Earth has perform'd a Compleat Revolution about its own Axis; because the Meridian B G, in the second Day's Posture, is made parallel to A F, its first Day's Posture: But it is not yet apparent Noon, till the same Point of the Earth, by its Revolution be brought to K, where



where 'tis turn'd directly to the Sun, who governs the Civil Days.

And that this time is not the same with the Celestial or Equal Noon, will be prov'd, not only because the Earth has not yet performed its Mean Motion above its Revolution (tho' this were a sufficient Argument,) but also because the diurnal Motions about the Sun, and consequently the Returns of any certain Meridian to him, are very unequal: Neither can that possibly be equal, in respect of any Point, about which the Earth is carried equally; as is sufficiently manifest from the Inspection of the Scheme only. Wherefore the Mean Noon and Equal Time respect the Point of the Mean Motion, (that is, the Center of the Orbit at C) and in our present Instance, is then, when the Meridian carried from K, arrives at L, where it is directly turn'd to the Center of the Orbit at C. And when it has gained this Posture, the Earth has performed its Mean Motion above a Revolution requisite to compleat a Mean Day.

For the Arch GL, or the Angle GBL is equal to the Angle ACB, the Mean Diurnal Motion of the Earth. Also the Arch GK, which the Earth, or any Meridian therein, must pass more than a Revolution, before it be Apparent Noon, is equal to the Angle AOB, the Apparent Motion of the Earth at the Sun.

From whence 'tis evident, that the Arch KL, which the Circumference of the rolling Earth performs between the Apparent and Mean Noon, and which shews the Difference between the Apparent and Mean Day, is equal to the Angle OBC, which is the Equation of the Orbit.

Wherefore the *Prosthaphæresis* of the Orbit reduced into Minutes and Seconds of Time, shall be the second part of the Equation of Time derived from the Earth's Motion. Which Equations throughout this Semicircle of the Orbit (that is, while the Mean Anomaly is 0, 1, 2, 3, 4, 5 Signs) are Negative, or to be subtracted from the Apparent Time; for herein the Mean Noon succeeds the Apparent.

In like manner, if we take the opposite Place of the Scheme, and consider the Earth in its Perihelion, the Point I, or the Meridian EI, being made parallel to its Yesterday's Posture, 'tis plain, that the Earth has performed one compleat Revolution.

This Point being carried to N, where 'tis turned to the Center of the Orbit, 'tis now Mean Noon: For the Arch NI, or the Angle NEI, equal to the mean diurnal Motion

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of the Earth, is passed over. But it is not yet Apparent Noon, till the Earth, by its Rotation, brings the same Meridian to M. where it is directly turned towards the Sun. From whence 'tis manifest, that the Apparent Day exceeds the Mean by so much time as is requisite for the Earth to pass the Arch N M; which Arch is equal to the Angle C N O, the *Prosthapheresis* of the Orbit. Wherefore reducing this into Time, gives the Equation of Natural Days, in respect of the Earth's Motion, which throughout this Semi-circle of Anomaly (*i. e.* while the Earth moves from her Perihelion to her Aphelion) is Affirmative, or to be added to the Apparent Time; because herein the Mean Noon precedes the Apparent.

'Tis manifest, from what goes before, that if the Sun were in the Center of the Earth's Annual Orbit, and the Earth's Axis were not inclin'd to its Path, or Way, there would be no Inequality of Time; but the Mean Day and Apparent would be equal.

Moreover, if there were no Eccentricity of the Sun from the Center of the Earth's Orbit, but there were the usual Inclination of the Earth's Axis to the Orbit, or, as the *Ptolemaicks* do express it, the Obliquity of the Ecliptic; then, I say, this second part of the Equation of Time would vanish, and there would be only the first part of the Equation, which was only retain'd by all the ancient Astronomers.

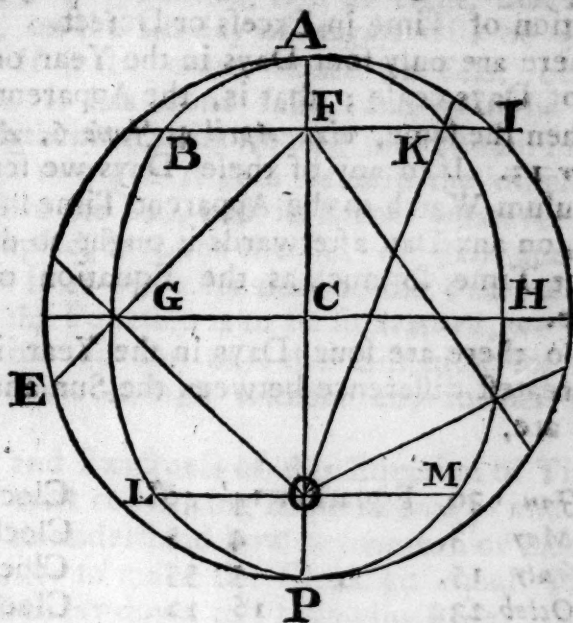
I having now shewn, and demonstrated, that the Equation of Time depends on two Causes; and in the First Part having fully finish'd, and brought into a Practical Table, which you have in Page 2, of my *Astronomical Tables*; it is now my next business to reduce the Second Part into a Practical Table also, which will compleat the whole Equation of Time.

But first, I shall shew the greatest Elliptic Equation of the Earth's Orbit, according to several Authors which are come to hand.

	°	'	"
<i>Ptolemy, Claudius in Mullerus</i>	2	23	00
<i>Alphonsus, King of Castile, in Mullerus,</i>	2	10	00
<i>John Newton, in his Math. Institutions.</i>	2	04	47
<i>John Kepler, Rudolphin,</i> — —	2	03	46
<i>Natalis Duret</i> — — —	2	03	46
<i>William Leyburn, in his Cursus Mathem.</i>	2	03	42
<i>Tycho Brahe,</i> — — —	2	03	15
<i>Johannes Maginit, in his Ephemerides,</i>	2	03	12

Ed.

But in any other part of the Orb, it will require a further Calculation to find the Mean & True Anomalies (which shall be shewn in its proper place) whose difference is the Elliptic Equation, and makes up the Table in Pages 28, 29, and 30, of my *Astronomy*; which Table being reduced into Time, are the Numbers in Page 3, of my *Astronomy*, and is what is called the Second Part of the Equation of Time, depending on the Sun's Eccentricity: And this answers to every Degree of Mean Anomaly, whose Use you will find in *Precept 2*, Page 339, of my *System*.



Here are therefore demonstrated two sorts of Equation of Time, arising from two different Causes: If they are both to be added, or both to be subtracted, their Sum is to be added or subtracted; but if one be to be added, and t'other subtracted, their difference, according to the nature of the greatest, is to be added or subtracted to or from the Apparent to get the Mean.

After clearing the Theory of this Doctrine, I come next to apply it to Practice, in regulating curious Time-keepers; which indeed are very often abused, for want of the due Consideration and right Application of this Equation of Time. For at some times of the Year it happens, that if our Watches, or oscillating Pendulums do not differ above a quarter of an Hour from the Time shew'd by the Sun or Stars, they are false, and need a Correction. And the reason of this is plain: For if a Pendulum-Watch goes true, it goes equal; that is, one twenty four Hours at any time of the Year, is as long as another twenty four Hours at any other time of the Year, and this perpetually and constantly: That is, all Watches that go true, measure the Equal or Mean Time, and consequently differ from the Apparent Time shewn

shewn by a Sun-Dial or other Instrument, as much as is the Equation of Time in Excess or Defect.

There are only four Days in the Year on which the Equation of Days cease; that is, the Apparent and Mean Time are then the same, viz. *April 4, June 6, August 20, and December 13.* If to any of these Days we set a well regulated Pendulum-Watch to the Apparent Time shewn by the Sun or Stars, on any Day afterwards it ought to differ from this Apparent Time, so much as the Equation of Time is in the Table.

Also there are four Days in the Year in which there are the greatest difference between the Sun and the Clock; and those are,

{	<i>Jan. 30,</i>	Equation $14^{\circ} 49''$	Clocks too fast.
	<i>May 3,</i>	4 5	Clocks too slow.
	<i>July 15,</i>	5 55	Clocks too fast.
	<i>Octob 23,</i>	16 12	Clocks too slow.

By which it appears, that from *April 4, to June 6,* the Equation must be added to the Equal Time, to give the Apparent; from *August 20, to December 13,* the Equation is again added to the Equal Time, to gain the Apparent; but from *December 13. to April 4,* it is to be subtracted. But if you would reduce the Apparent Time to the Equal, you must use the contrary Titles; that is, now subtract, where you there added. Therefore in regulating curious Time-keepers for Astronomical use, you must always observe, that they differ from the Time observed by the Sun or Stars, so much as is the Equation of Time for that Day. As, suppose *July 8,* the Equation is $5^{\circ} 40''$ Clocks too fast; therefore this Equation is to be subtracted from the Time shewn by the Sun or Stars: But if the same Equation be added to the Apparent Time shewn by the Sun, the Sum will be the Equal Time shewn by the Clock.

Wherefore if at any time we set our Pendulum-Watch, in order to rectifie it, and bring it exactly to measure the Mean Day, we are to add or subtract from the Apparent Time shewn by the Sun, so much as is the Equation of Days at the time we set it.

For Example; at Noon, or just when the Sun is on the Meridian, that is, when the Apparent Time is exactly 12 a Clock the 8th Day of *July* I set my Watch, the Equation is then $5^{\circ} 40''$ add to the Apparent Time: Wherefore I set my

my Watch to 12 h. 5' 40"; which, if it go right, that is, equally, as it ought, on the 8th day of *August* will be 3' 13" before the Sun: If it be either more or less, behind or before the Sun, it has gone false, and is to be rectified, either by lengthening or shortening the Pendulum as much as is requisite to make it gain or lose the difference between 3' 13" before the Sun, and its Error, whatever it is in 31 Days time elapsed, between the 8th of *July* and the 8th of *August*. But if at any other time of the Year, we set our Watches when the Equation is to be subtracted, we must put it so much behind the Sun as is the Equation for that Day. But this is plain enough without any further Illustration.

Of the Certainty and Exactness of this Equation of Time, I have made many most convincing Experiments; and because it is necessary to understand how to lengthen or shorten the Pendulum, in order to make the Clock go equal Time the Year round, I shall lay down this following Rule.

The Lengths of Pendulums are to each other reciprocally as the Squares of their Vibrations in the same time.

Thus, if a Pendulum 39.2 Inches long vibrates 60 times in a Minute, how oft will a Pendulum 9.8, (*viz.* a quarter of 39.2) Inches vibrates in a Minute?

As the Length of the shortest Pendulum 9.8;

To the Length of the other Pendulum;

So are 3600, the Seconds in a Minute, to a Fourth Number, whose Square Root are the Vibrations in a Minute of the shorter Pendulum.

C

OPE-

OPERATION.

Length P.	60'		Length Pend.
	60		
As 9.8:	3600	::	39.2
			3600

			235200
			1176

			9.8) 141120.0 (14400 (120"
			 1
			98

			22) 44
			431
			44

			392
			00

			00

Answer. 120 Vibrations in a Minute, of that Pendulum whose Length is 9.8.

Secondly, If it be demanded, how oft a Pendulum 43.5 Inches long vibrates in a Minute, the Analogy is this:

Pend.	"	Pend.
As 43.5 :	3600	:: 39.2
		3600

		235200
		1176

		43.5) 1411200 (3244 (37" <i>feet</i> .)
		 25
		1305

		1062 107(744
		870 749

		1920
		1740

		1800
		1740

		60

And

And seeing each Vibration of the Pendulum in a Clock adapted for it, sets the Hand forward a Second, by knowing the Number of Vibrations which a Pendulum 43.5 Inches long performs in a Day less than a Pendulum 39.2 Inches long, we may know the Number of Seconds which it will slacken the Index of the Clock less than 39.2 Inches long.

Contrarily, Let it be required, to find the Length of a Pendulum, which shall make any assign'd Number of Vibrations in a Minute?

As for Example: Let the Number of Vibrations be 57; Length of a String counted from the Point of the Suspension, to the Center of Oscillation, or of the Bullet or round Ball at the End of it, is required?

Since the Lengths of Pendulums are to each other as the Squares of their Vibrations; therefore it will hold, As the Square of the Number of Vibrations, are to the Length of the Pendulum 39.2, which vibrates Seconds; So is the Square of 60, the Seconds in a Minute, To the Length of the Pendulum requir'd.

OPERATION.

$$\begin{array}{r}
 57 \quad 60 \\
 57 \quad 60 \\
 \hline
 399 \quad \hline
 285
 \end{array}$$

----- P.

As 3249 : 39.2 :: 3600

3600

235200

1176

3249) 141120.0 (43.4 Inches, Length of Pend. req'd.

12996

What I have given on this Head, may be of excellent use, both to Regulate the Motion of a Clock or Watch, and exactly to measure Time without either; which may

gratify and assist the curious Astronomer in observing Eclipses, especially those of the Satellites of *Jupiter*, and in the Transits of the Moon under the Fixed Stars, and her Occultations of them, whose Duration may be measured, without Clock, Watch, or any such Way of distinguishing Time.

And here let the Reader observe, that Pendulums of the same Length do not, in different Places on the Globe, make their Vibrations in the same time; but towards the Poles, where the Gravity is strongest, they move quicker than near the Equator, where they are less impelled to the Center: And accordingly, Pendulums that measure the same Time by their Vibrations, must be shorter near the Poles, than at a greater distance. Both which Deductions are found to be true in fact; of which Sir *Isaac Newton* has recounted particularly several Experiments; in which it was found, that Clocks exacted, adjusted to the true Measure of Time at *Paris*, when transported nearer to the Equator, became erroneous, and mov'd too slow; but were reduced to their true Motion, by contracting their Pendulums.

Sir *Isaac* was particular, in remarking how much they lost of their Motion, while the Pendulums remain'd unalterable; and what Length the Observers are said to have shortened them, to bring them to Time.

And the Experiments which appear to be most carefully made, shew the Earth to be raised in the Middle between the Poles about seventeen Miles, which is caused by its Rotation upon its own Axis.

CHAP.

CHAP. II.

How to observe the Sun's Ingress into any Point of the Ecliptic.

FOR this purpose you must be provided with an exquisite Astronomical Quadrant; by which you may take an Altitude to Seconds; and from that you must truly determine the Elevation of the Pole at the Place of your Habitation. Then take the Sun's Meridional Altitude on the Day you think the Sun may be near that Point of the Ecliptic which you are seeking; and also on the Day following, if possible, or as soon as you can, take his Meridional Altitude a second time; and by these two Meridional Altitudes you will discover whether he is short, or past the Point of the Ecliptic which you are seeking. By these two Meridional Altitudes, and the Latitude of the Place of Observation, you may find the Sun's Declination, and consequently his true Longitude, answering, as I have taught in my *Compleat System of Astronomy*. Then, if one Altitude be short, and the other past the Point of the Ecliptic sought, add the two Places agreeing to those Altitudes, together, and say, As the Sum of those two Longitudes, or Distance of the Sun from the Point of the Ecliptic sought, Is to the Space of Time between the Two Observations; So is the Distance of the Sun from the Point of the Ecliptic sought, To a proportional Part of the Time; which added to the Time of the First Observation, will give the Time the Sun is in the Point of the Ecliptic sought.

But if the Observations are both taken when the Sun is either short, or past the Point of the Ecliptic, then, instead of the Sum of the Sun's Longitudes, you must take the Difference, and say as before: And if the Declination at the time of the first Observation be less than the Declination of time of the second Observation, the proportional part of the time must be subtracted from the time of the first Observation. But if the Declination at the time of the first Observation be more than the Declination at the time of the second Observation, then the propor-

tional part of time must be added to the time of the first Observation, and you will gain the time of the Sun entering that part of the Ecliptic sought.

Example. Anno 1727, at London I observed the Sun's Meridian Altitude, March 9, to be $38^{\circ} 12' 56''$; and March 10, next following, I observed his Meridian Altitude to be $38^{\circ} 36' 38''$. I demand the exact time of the Solar Ingress into the Equinoctial Sign *Aries*?

OPERATION.

1. For the Place of the Sun, answering the first Observation.

		0	,	"	
Sun's Meridian Altitude observed		38	12	56	Subt.
Altitude of the Equator at London,		38	28	00	from
Remains Sun's Declination South,		00	15	04	
		0	,	"	
As S. Obliquity	23 29 00	9.600409			
To S. Declination South	00 15 04	7.641594			
So Radius	--- 90 00 00	10.000000			
To S. Long. short of γ	00 37 48	8.041185			
From	12S. 00 00 00				
☉'s true Place obs.	11 29 22 12				

Note, Because the Meridian Altitude of the Sun is less than Alt. Equat. proves Decl. to be South.

2. For the Place of the Sun's answering the second Observation.

		0	,	"	
Sun's Meridian Altitude observ'd		38	36	38	
Altitude of the Equator at London,		38	28	00	
Remains the Sun's Declination North		00	08	38	
		0	,	"	
As S. Obliquity	23 29 00	9.600409			
To S. Declination North	00 08 38	7.399484			
So Radius	--- 90 00 00	10.000000			
To S. Longitude past γ	00 21 39	7.799075			

Hence

Hence it appears, that the time of the Vernal Equinox happen'd some time between the 9th and 10th days at Noon. Then to find out the precise time.

D.

Anno 1727	{	9 Sun short of the Equinox	37 48 2	+
March		10 Sun past the Equinox	21 39 5	

Sun's Diurnal Motion, Sum 59 27

Now say, by the Logistical Logarithms,

As Sun's Diurnal Motion	00 59 27 LL.	40
To one Day, or	24 00 00	3979
So is Dist. on the 9th day	00 37 48	2007
To the proportional Part	15 15 34	5946

Which is the true time of the Vernal Equinox, viz, March 10, 15' 34" past 3 in the Morning, by Observation; and agrees exactly with my Tables, which, for your satisfaction, you may try at your own leisure.

And after this manner you may find the Time of the Sun's Entrance into any of the Twelve Signs, or into any Point of the Ecliptic desired, by taking Two Meridional Altitudes near the time in a known Latitude.

Example 2. Anno 1730, June 11, at London, I observed the Sun's Meridional Altitude to be $61^{\circ} 56' 54''$; and June 12, I observed it to be $61^{\circ} 56' 26''$. I demand the time of the Sun's Ingress into the Tropical Sign Cancer?

OPERATION.

Sun's Merid. Alt. observ'd June 11, was	61 56 54
Altitude of the Equator at London	38 28 00
Remains the Sun's Declination North	<u>23 28 54</u>

	° ' "	
As S. Obliquity	23 29 00	9.600409
To S. Declination	23 28 54	9.600382
So Radius ----	90 00 00	10.000000
To S. Longitude à ∞	89 21 41	9.999973
From ----	180 00 00	
Remains ----	90 38 19 = 35.0° 38' 19"	(Sun's Place.

2. For the Sun's Place, answering the second Observation.

Sun's Meridional Altitude observed	61 56 26
Altitude Equat. at London	38 28 00
Remains Sun's Declination North	23 28 26

	° ' "	
As S. Obliquity	23 29 00	9.600409
To S. Declination	23 28 26	9.600241
So Radius ----	90 00 00	10.000000
To S. Longitude	88 24 28	9.999832
From ---	180 00 00	
Remains ---	91 35 32 = 35.1° 35' 32" ☉'s Pl.	

Hence it appears, that the Sun is past the Solstice at both the Observations. Therefore,

	S. ° ' "	
☉'s Place observed { 12 } Day { 3 1 35 32		
{ 11 } is { 3 0 38 19		
Sun' Diurnal Motion	0 57 13	

Now say,

If ☉'s Diurnal Motion	00 57 13	— 206 Co.Ar.	794
Give One Day or	24 00 00	3979 ?	3979
What will first Obserat.	00 38 19	1948 S	1948
Answer, Sub.	16 4 15	5721	5721
From the Day on first Obs.	24 00 00		
Sun in ☿ June 10	7 55 45	Apparent Time.	

By these Examples the young Tyro may find by Observation, when the Sun apparently enters any Sign of the Ecliptic; by which he may examine the Solar Tables, whether they

they correspond with the Observations of the present Age ; as you will find mine exactly to agree, the Observations being made with a new-invented Quadrant of Brals, answering to a Radius of 270 Feet.

CHAP. III.

An Investigation of the Earth's Aphelion and Annual Inequality.

ANNO 1726, April 29, at London, I observ'd the Sun's Altitude on the Meridian $56^{\circ} 5' 16''$; July 13, following, $58^{\circ} 24' 34''$, and September 8, the same Year, $39^{\circ} 59' 55''$; by which Meridional Altitudes corrected by Parallax and Refraction, with the Obliquity of the Ecliptic $23^{\circ} 29'$, and the Latitude of London $51^{\circ} 32'$ North, the three Longitudes of the Sun are determin'd as follows.

	0	'	"
Sun's Merid. Alt, in the first Observation	56	5	16
Elevation of the Equinoctial at London Sub.	38	28	00
Remains the Sun's Declination North,	17	37	16

Now, for the Sun's Place, say,

	0	'	"
As S. of the Obliquity	23	29	00
To S. Declination	17	37	16
So Radius	90	00	00
To S. Longitude from γ	49	26	10
That is, in $\odot$	19	26	10

2. For the Sun's Place in the second Observation.

Sun's Meridian Altitude	58° 24' 34"
Elevation of the Equin. at <i>London</i> Sub.	38 28.00
Remains the Sun's Declination North	19 56 34

Now for his Place answering.

As S. Obliquity	23 29 00	9.600409
To S. Declination	19 56 34	9.532909
So Radius	90 00 00	10.000000
To S. Longitude	58 52 34	9.932500
From ----	180 00 00	
Remains ----	121 7 26 = 48.1° 7' 26" ☉'s Pl.	

3. For the Sun's Place in the third Observation.

Sun's Meridian Altitude	39 59 55
Elevation of the Equinoct. at <i>London</i> Sub.	38 28 00
Remains the Sun's Declination North	1 31 55

Now for his Place answering.

As S. Obliquity	23 29 00	9.600409
To S. Declination	1 31 55	8.427114
So Radius	90 00 00	10.000000
To S. Longitude	3 49 50	8.826705
From ----	180 00 00	
Remains	176 10 10 = 58.26° 10' 10" ☉'s Pl.	

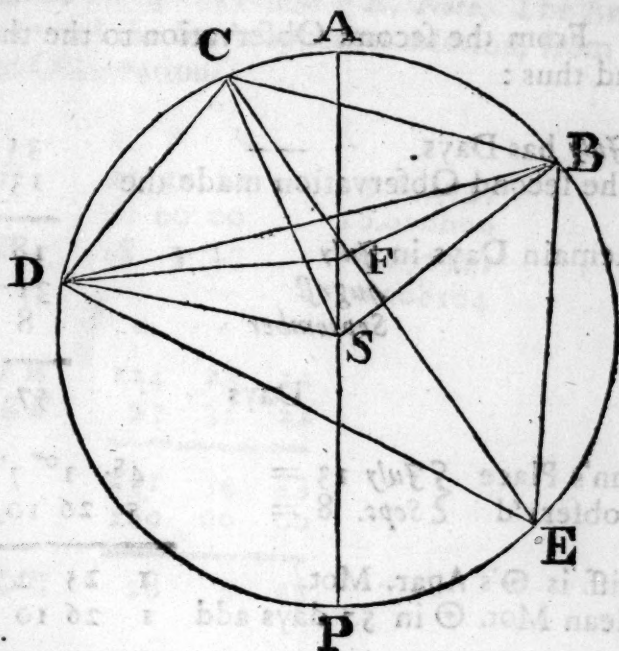
In the adjacent Diagram, let *S* represent the Sun; on which, as a Center, describe the Circle, whose Radius is equal to the Transverse Diameter of the Earth's Ellipsis; draw the Diameter *A P*, and lay off the Sun's Place observed at *B C* and *D*, by help of the Sector; and draw *S D*, *S B*, *S C*; and also from *F* the upper Focus, draw *F D*, *F B*, *F C*; continue *C F* to *E*, and draw *B C*, *C D*, *D E*, and *E B*: Then

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because the Angles FBS, FCS, and FDS are equal to half the Elliptic Equation, all the Angles at F and S are known from the times between the Observations, as follows; according to the Method of *Petrus Herigonus*, Professor of Mathematicks at *Paris* 1644. From the first Observation to the second, are 75 days, as appears from this Work.



April 30
Day observ'd 29

April	1	} Sun's Place {	April 29 =	8	19	26	10
May	31		July 13 =	2	1	7	26
June	30						
July	13						
Days		75	Difference 2 11 41 16				
			between the first and second Observation,				

and is the Sun's apparent Motion for 75 Days = $\angle BSC$.

This done, take out of my Astronomical Tables the Middle Motion of the Sun for 75 days; which reckoned from the beginning of *January*, will fall upon *Mar. 16*, Mean Mot.

☉ answering — — — $28. 13^{\circ} 55' 24''$

Appar. Mot. ☉ equal to the Arch B A C + 2 11 41 16

Sum	4	25	36	40
	2	12	48	20

Half Sum is the Angle BFC

Or subtract the Mean Motion ☉ for *April 29*, from the Mean Motion for *July 13*, and the Remainder will be $28. 13^{\circ} 55' 24''$, as above.

2. From

2. From the second Observation to the third, are 57 days found thus :

July has Days.	—	31
The second Observation made the	13	Day.
Remain Days in July	18	
August	31	
September	8	
Days	57	
Sun's Place { July 13 =	45. 1° 7' 26"	
observ'd { Sept. 8 =	5 26 10 10	
Diff. is ☉'s Apar. Mot.	1 25 2 44 =	∠ CSD.
Mean Mor. ☉ in 57 days add	1 26 10 55 =	Feb. 26.
Sum	3 21 13 29	
Half	1 25 36 49 =	∠ CFD.

3. From the first Observation to the third, are 132 Days.

April has 30 Days.	
Observ'd 29	
Remains 1 Day in April.	
In April 1 Day	S. 0 0 0
May 31	Sun's Place { April 29 = 1 19 26 10
June 30	observ'd { Sept. 8 = 5 26 10 10
July 31	Diff. is ☉'s App. Mot. = ∠ BSD 4 6 44 00
Aug. 31	Mean Mor. in 132 D. = May 12 4 10 6 19
Sept. 8	
Sum 132 Days	Sum 8 16 50 19
Half is = ∠ BFD	4 8 25 9½

Note, Supposing the Logarithm of FD 10.000000; then in the Triangle DEF are given, (1.) the Radius DF , whose Logarithm is 10.000000. (2.) the Angle DFE $124^{\circ} 23' 11''$ the Complement of the Angle CFD $55^{\circ} 36' 49''$. (3.) the Angle

Angle DEF $27^{\circ} 31' 22''$, it being half the Angle of DSC $55^{\circ} 21' 44''$, by *Euclid* 20, 3. To find FE, Note, The Angle CSD is the Quantity of the Sun's apparent Motion, from the second to the third Observation.

As S. $\angle$ DEF	27 31 22	9.664737
To Radius	90 00 00	10.000000
So S. $\angle$ FDE	28 5 27	9.672901
To FE	---	10.008164

$\angle$ DFE	124 23 11
$\angle$ DEF	27 31 22
Z	151 54 33
From	180 00 00
$\angle$ FDE	28 5 27

2. In the Triangle FEB are known, (1.) FE just now found. (2.) the Angle FEB $35^{\circ} 50' 38''$, it being half of the Angle BSC $71^{\circ} 41' 16''$, the apparent Motion of the Sun from the first to the second Observation. (3.) the Angle BFE $107^{\circ} 11' 40''$, it being the Complement of the Angle BFC $72^{\circ} 48' 20''$, to find FB.

As S. Angle FBE	36 57 42	Co. Ar.	0.220922
To FE	---	---	10.008164
So S. $\angle$ FEB	35 50 38		9.767587
To FB			9.994673

$\angle$ EFB	107 11 40
$\angle$ FEB	35 50 38
Z	143 02 18
From	180 00 00
$\angle$ FBE	36 57 42

3. In the Triangle DBF are given, (1.) FB , just now found; (2.) The Angle DFB $128^{\circ} 25' 9'' \frac{1}{2}$; (3.) The Side DF , to find the Angle DBF , and the Side DB .

This is the second Axiom of Oblique-angled plain Triangles; which is, As the Sum of the two Sides, including the given Angle; Is to their Difference; So is the Tangent of half the Sum of their opposite Angles, To the Tangent of half the Difference of the said Angles: Which added to the half Sum of the opposite Angles, gives the greater Angle sought; and subtracted, gives the lesser. But in this Case, because we have only the Logarithm of the Sides given, you must work thus, *viz.*

To the Logarith. of DF 10.000000, add Radius 10.000000, and from that Sum 20.000000, subtract the Logarithm of FB found in the last Operation, and that gives the Tangent of an Arch; from which always subtract 45° , and note the remaining Arch. See the Operation at large.

To Radius DF .	10.000000
Add the Logarithm	10.000000
Double Radius	20.000000
FB subtr.	9.994673
Tang. $45^{\circ} 21' 5''$	10.005327
Sub. 45 00 00	
Rem. 00 21 5	

$\angle DFB$	$128^{\circ} 25' 09'' \frac{1}{2}$
From	180 00 00
Z of $\angle L$	51 34 50 $\frac{1}{2}$
Half =	25 47 25 $\frac{1}{4}$

Now

New fay,

	°	'	"		
As Radius	---	90	00	00	10.000000
To $\angle$ of the remaining Arch		00	21	05	7.787634
So $\angle$ of half Z of oppos. Ang.		25	47	25	9.684136
To $\angle$ of half X of the Ang. +		00	10	11	7.471770
Sum is the $\angle$ DBF		25	57	36	
Half Z Opposit. $\angle$ L		25°	57'	25"	
Half X $\angle$ L		00	10	11	
$\angle$ FDB		25	37	14	

Now, for the Side DB fay,

	°	'	"	
As S. $\angle$ DBF	25	57	36	9.641219
To Radius = DF	90	00	00	10.000000
So S. $\angle$ DFB	51	34	50 $\frac{1}{2}$	9.894030
To DB				10.252811

4- In the Triangle DSB , are known, (1.) DB just now found. (2.) The Angle DSB $126^{\circ} 44' 00''$, it being the Sun's apparent Motion from the first to the second Observation. (3.) The Angles SDB and SBD are both known to be the same Quantity; because the Triangle is Isosceles, viz. SD and SB are equal; therefore the Angles they subtend, are also equal, being half the Complement of the Angle DSB to a Semicircle, to find DS .

	°	'	"		
As S. $\angle$ D S B	53	16	00	Co, Ar;	0.096136
To D B					10.252811
So S. $\angle$ D B S. ..	26	38	00		9.651648
To D S					10.000595

$\angle$ DSB	126°	$44'$
From	$180.$	$00.$
Z of $\angle$ L	53	16
$\angle$ SDB	26	38
$\angle$ SBD	26	38

5. In

5. In the Triangle FDS , are given, (1.) $FD = \text{Radius}$; (2.) DS just now found. (3.) $\angle FDS$, to find the Angle FSD , and FS : That is, as in the third hereof: The Logarithm of two Sides of a plain Triangle, and the Angle comprehended being given, to find the other Angles.

1. As the lesser Side is to the greater; so is Radius to the Tangent of an Arch.

2. As the Tangent of 45° ,
Is to the Tangent of the found Arch less 45° ;
So is the Tangent of half the opposite Angles,
To the Tangent of half their Difference.

OPERATION.

As the lesser Side DF	10.000000
To the greater DS	10.000595
So Radius	10.000000
To the $t.$ of the Arch $45^\circ 2' 21''$	10.000595
Sub.	45 0 00
Rem.	00 2 21

Now say,

As $t.$ of	45 00 00	10.000000
To $t.$ of the remaining Arch	00 02 21	6.826388
So $t.$ half Z Op. $\angle \angle$ at F and S	89 29 37	12.045137
To $t.$ of half their X sub.	4 15 16	8.871525

Rem. $\angle FSD$ the true Anom. $85^\circ 14' 21'' = 2S. 25^\circ 14' 21''$

$\angle SDB$ $26^\circ 38' 00''$

$\angle FDB$ $25^\circ 37' 14''$

$\angle SDF$ $1^\circ 00' 46''$

From $180^\circ 00' 00''$

$\angle \angle F \& S$ $178^\circ 59' 14''$

Half $\equiv$ $89^\circ 29' 37''$

[Fot

For F. S.

	0	'	"	
As S. $\angle$ FSD	85	14	21	9998499
To DF Radius	90	00	00	10.000000
So S. $\angle$ FDS	1	00	46	8.241975
To FS				8.241476
Place of $\odot$ in the his Observation	58	26	10' 10"	
The $\angle$ FSD = to true Anom. sub.	2	25	14 21	
Remains the $\odot$'s true Apogeon	3	00	55 49	
And the Aphelion of the Earth	9	00	55 49	

6. For the Eccentricity of the Earth in such Parts as her mean Distance from the Sun, is 100000, the Proportion is,

As DS, found in the 4 hereof	10000595
To SF, found in the 5	8.233476
So is the mean Distance 100000	5000000
To the Eccentr. Parts CF 1749	3242881

This being corrected according to the following Scheme, will be equal to CK 1692.

7. To find the mean Anomaly.

First, You are to observe (in all the Planets) that the difference between the true and mean Anomaly is the Elliptic Equation; which, in the first Observation is the Double of the Angle FBS; in the second, the double of the Angle FCS; and in the third, the double of the Angle FDS: But this way of Investigation stands in need of a Correction, as shall be shewn by and by. But first, for the mean Anomaly.

In the third Observation, the Angle FDS is $1^{\circ} 0' 46''$; which doubled, is $2^{\circ} 1' 32''$, the Equation; and the Angle FSD is the true Anomaly, $28.25^{\circ} 14' 21''$; then what's the mean Anomaly?

True Anomaly = $\angle$ FSD	28.25 ² 14' 21"
Double of $\angle$ SDF add	2 1 32
Sum is the mean Anom. at the 3d Observ.	2 27 15 53

D

8. To

{For

8. To correct the Elliptic Equation.

Let $AHIEP$ be supposed the Semi-Ellipsis, and the Semicircle $AGDP$, describ'd upon the Extrems of the Transverse Diameter, the Ordinates CE and BH being extended to D and G , in the Periphery of the Circles : Then,

As $CD : BG :: CE : BH$.

Therefore,

As $CE ; CD :: t. BFH t. BFG$.



But before we can clear up this Analogy, we must first shew how to find CE , the Semiconjugate of the Ellipsis, which is done thus :

In the Right-angled Triangle FCE , are given FE , the mean Distance of the Sun from the Earth 10.0000, and FC the Eccentricity 1692, to find CE , the semiconjugate Diameter ; which is done by the 47th of the first of *Euclid*, thus :

Square of $\begin{cases} EF \\ CK \end{cases}$	10000000000
	2862864
	9997137136(9998) = EC .
Remains	—

Now suppose the Sun at I in the Ellipsis ; then will the Angle AFH be the Mean Anomaly, and in the third Observation equal to $2^s. 27^{\circ} 15' 53''$, AFG the correct Anomaly ; draw IK parallel to HF ; then is the Angle $KIF = HFI$ the Variation ; which in the first and fourth Quadrants of the Ellipsis are to be subtracted from the Elliptic Equation ; but in the second and third, added. So that in the third Observation above, the Sum is in the first Quadrant, and the Variation equal to the Angle KIF , is thus obtain'd :

As

As CE, the Semiconjugate	99985	4.999935
To CD, the Mean Distance	100000	5.000000
So $\angle AFH$	$85^{\circ} 15' 53''$	11.320792
To $\angle AFG$	$87 15 54$	11.320857

Difference is the Variat. $1 = \angle KIF.$

Equat. found $= \angle SIF$ 2 1 32

Absolute Equation is 2 1 31 $= \angle SIK.$

But by a Repetition of the Work, I find in the third Observation,

	S. ° ' "
The Mean Anomaly	2 19 52 46
The Elliptic Equation	1 54 4 sub.
Apogee of $\odot$	3 8 11 28
And the Eccentricity	1692 Parts, such as the Mean distance of $\odot$ from the Earth is 100000.

And in the first and second Observations, as follows.

	Anom.		Equat.		Apog.		Eccentr.
	S. ° ' "		° ' "	S. ° ' "			
1.	10 9 46 50		1 28 15 +	3 8 11 52			
2.	0 23 42 00		0 45 52 -	3 8 11 18 5		1692	

D 2

CHAP.

CHAP. IV.

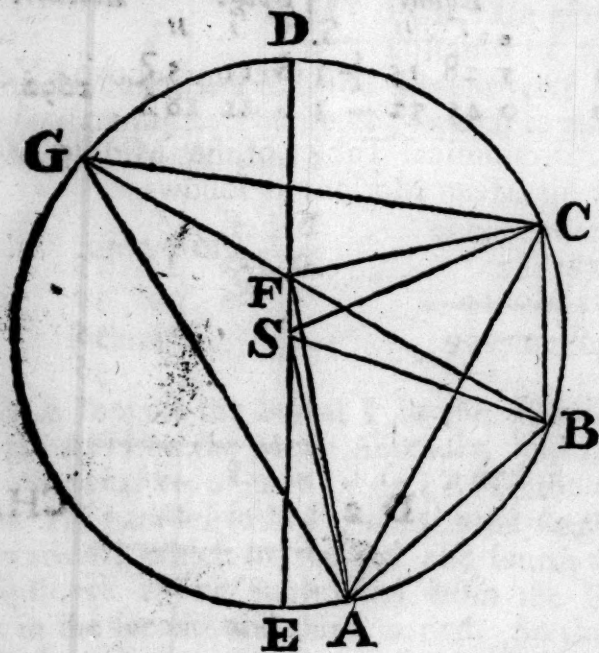
To find the Mean Anomalies, Eccentricities and Apbelions of the Three Superiour Planets.

TO do this, there must be had the true Equal Times of their being in Opposition to the Sun, and taken three several times in that Achronical Posture, as follows :

Example. The equal times of three Oppositions of the Sun and Mars, taken at London by my self, were as follows.

				Heliocentric Place ☿					
				d.	h.	'	"	S.	°
Anno 1719	Aug.	16	10 48 36	A	11	3	55 27	}	From
1721	Octob.	24	14 32 13	B	1	12	37 49		Vernal
1723	Dec.	10	6 59 38	C	2	29	27 54		Equin.

Let S denote the Center of the Sun, F the other Focus of



the Ellipsis of Mars; the Semidiameters of the Circle SA, SB, SC, being equal to the transverse Diameters of the Ellipsis; and passing by his Places in the first Observation at A, in the second at B, and the third at G; from which draw Lines to the Sun at S, and also to the Focus

at F; continue BF to G, and draw the order Lines, as in the Figure.

1. From

1. From the first Observation to the second, the apparent Motion of *Mars* in the Arch A B is thus found :

	S.	°	'	"
Place of <i>Mars</i> { B	1	12	37	49
{ A	11	3	55	37
Apparent Motion A B	2	8	42	12

From *August* 16, at 10 h. 48' 36", 1719, to *October* 25, 1721, at 32' 13" past 2 in the Morning, is two Years compleat, and 69 d. 3 h. 43' 37".

O P E R A T I O N.

	D.	°	'	"	
<i>August</i> has	31	00	00	00	<i>Jan.</i> 31
First Observation	16	10	48	36	<i>Feb.</i> 28
					<i>Mar.</i> 10
Remains	14	13	11	24	
<i>September</i>	30	00	00	00	Days 69
<i>October</i>	24	14	32	13	
Time —	69	03	43	37	over and above 2 Years

Now, from my Astronomical Tables of the Middle Motion of *Mars*, collect his Mean Motion, as follows.

	S.	°	'	"
Two Years compleat	0	22	34	19
<i>Mar.</i> 10 = 69 Days Motion	1	06	09	39
Hours 3 — —			3	56
Minutes 43 — —				56
Seconds 37 — —				1

Mid. Mot. from the first to 2d Obs.	1	28	48	51
Apparent Motion = Arch A B	2	08	42	12

Sum	4	07	31	03
Half = $\angle$ AFB	2	03	45	31 $\frac{1}{2}$

D 3

2. From

As S. $\angle$ CGF	$23^{\circ} 25' 2''$	9.599254
To Radius CF	90 00 00	10.000000
So S. FCG	$23^{\circ} 31' 11''$	9.601043
To FG		10.001789

CGF	$23^{\circ} 25' 2''$
CFG	133 3 47

Z	$156^{\circ} 28' 49''$
	180 00 00

FCG	$23^{\circ} 31' 11''$
-----	-----------------------

2. In the Triangle FAG are given, (1.) FG just now found. (2.) The Angle FGA $24^{\circ} 21' 6''$, it being half the Angle at the Center ASB $68^{\circ} 42' 12''$, the apparent Motion from the first to the second Observation. (3.) The Angle AFG $116^{\circ} 14' 29''$, it being the Complement of the Angle AFB $63^{\circ} 45' 31''$ to a Semicircle, to find FA ?

OPERATION.

As S. $\angle$ FAG	$29^{\circ} 24' 25''$	Co Ar.	0.308911
To FG	---		10.001789
So S. $\angle$ FGA	$34^{\circ} 21' 6''$		9.751518
To FA	---		10.062218

AFG	$116^{\circ} 14' 29''$
FGA	$34^{\circ} 21' 6''$

Z	$150^{\circ} 35' 35''$
From	180 00 00

FAG	$29^{\circ} 24' 25''$
-----	-----------------------

D 4

3. In

3. In the Triangle CFA are given, (1.) FA, just now found (2.) CF = to Radius (3.) The Angle CFA $110^{\circ} 41' 44''$, being the equal Motion of Mars from the first to the third Observation, to find the Angle FAC and the Side CA

As the lesser Side CF	—	10.000000
To the greater FA	—	10.062218
So Radius	----	10.000000
To s. of the Arch $49^{\circ} 5' 25''$		10.062218
Sub.	45 0 00	
Rem.	4 5 25	

BFC	$46^{\circ} 56' 13''$	
AFB	63 45 31	
CFA	110 41 44	
From	180 00 00	
ZLL	69 18 16	
Half	34 39 08	

As the s. of	$45^{\circ} 0' 0''$	10.000000
To s. of the rem. Arch	4 5 25	8.854351
Set Z opp. $\angle$ A & C	34 39 8	9.839607
To s half their X	2 49 47	8.693958

Rem. $\angle$ FAC	31 49 21
Sum is $\angle$ FCA	37 28 55

Now, for the Side AC.

As S. $\angle$ FCA	$37^{\circ} 28' 55''$	Co. Ar.	0.215732
To FA	----		10.062218
So S. $\angle$ CFA	29 18 16		9.971031
To AC	----		10.248981

4. In the Iſosceles Triangle CSA , there are given CA juſt now found. (2.) The Angle CSA $115^{\circ} 32' 17''$, requir'd CS ?

OPERATION.

Apparent Motions $\left\{ \begin{array}{l} ASB \ 68^{\circ} 42' 12 \\ \text{are the } \angle \angle \quad BSC \ 46 \ 50 \ 5 \end{array} \right.$

$CSA \ 115 \ 32 \ 17$
from $180 \ 00 \ 00$

Complem. $64 \ 27 \ 43, \frac{1}{2}$ is $= 32^{\circ} 13' 51'' \frac{1}{2}$ is the $\angle$ at SCA and SAC ; becauſe the Triangle is Iſoſceles.

As $S. \angle SCA$	$64^{\circ} 27' 43''$	Co. Ar.	0.044649
To CA	---	---	10.248981
So $S. \angle CAS$	$32 \ 13 \ 51$		9.726997
To CS	---	---	10.020627

5. In the Triangle FSC , are known, (1.) CF , as at firſt $= 10.000000$. (2.) CS , juſt now found 10.020627 . (3.) The $\angle FCS$ $5^{\circ} 15' 4''$, to find the $\angle FSC$, the true Anomaly, and FS , the Eccentricity?

As the leſſer Side FC	10.000000
To the greater SC	10.020627
So Radius	10.000000
To $s.$ of the Arch $46^{\circ} 21' 36''$	10.020627
Sub.	45 00 00

Remains $1 \ 21 \ 36$

FCA	$37^{\circ} 28' 55''$
SCA	$32 \ 13 \ 51$

FCS	$5 \ 15 \ 4$
From	$180 \ 00 \ 00$

$Z \angle \angle$	$174 \ 44 \ 56$
Half	$87 \ 22 \ 28$

Now

New say,

As ϵ . of	45° 00' 00"	10° 000000
To ϵ . of rem. Arch	1 21 36	8.375477
So ϵ . half Z opp. $\angle Z$	87 22 28	11.338599
To ϵ . half their X	27 22 13	9.714076

Rem. $\angle$ FSC true Anom, 60° 00' 15" = 28. 0° 0' 15"
 Place of σ at the 3d Observation add 2 29 27 54

Aphelion of σ = — 4 29 28 09

87° 22' 38
 27 22 28

Z 114 44 41
 from 180 00 00

Rem. 65 15 19
 = $\angle$ SFC

For FS.

As S. $\angle$ FSC 60° 00' 15"	9.937549
To CF 90 00 00	10.000000
So S. $\angle$ FCS 5 15 4	8.961520
To FS —	9.023971

Or thus:

As S. $\angle$ SFC 65 15 19 Co.	10.041828
To SC —	10.020627
So S. $\angle$ FCS 5 15 4	8.961520
To FS —	9.023975

6. For the Mean Anomaly in the third Observation, &c. the Angles SAF , SBF , SCF , are half the Elliptic Equations in the first, second, and third Observations; which doubled, and added to the true Anomaly, equal to the Angles ESA , ASB , ASC in the first Semicircle of the Ellipsis, but subtracted in the second Semicircle, the Sum or Difference is the Mean Anomaly.

Example

Example in the Work before us.

	From	S	°	'	"
True Anomaly = $\angle FSC$ sub.		12	00	00	00
		2	00	00	15
		9	29	59	45
		10	30	04	
The $\angle FCS$ $5^{\circ} 15' 4''$ doub. is Equat. sub.					
Rem. the Mean Anom. in the 3d Observat.		9	19	29	41
Mid. Mot. of Mars from the 2d to the 3d Obs.		1	17	02	21
Mean Anom. in the 2d Observation		8	02	27	20
Mean Mot. from the 1st to the 2d Observat.		1	28	48	51
Rem. Mean Anom. in the first Observation		6	03	38	29

7. For the Eccentricity.

As CS	10.020627	Co. Ar.	9 979373
To FS	---	----	9.023971
So Mean Distance	151955		5 181716
To Eccentricity	15313		4.185060

You must now make a Repetition of the above Work, by reason the Angle at F at the first stating is not perfectly true; but by going over of the Work again, I find the Place of the Aphelion in

	S.	°	'	"
the $\left. \begin{matrix} 1 \\ 2 \\ 3 \end{matrix} \right\}$ Observation to be	5	0	56	08
	5	0	58	49
	5	1	1	18

And the Eccentricity 14169 and a half, such Parts as the Mean Distance is 151955, and the Mean Anomalies and Elliptic Equations were as is here set down.

Mean

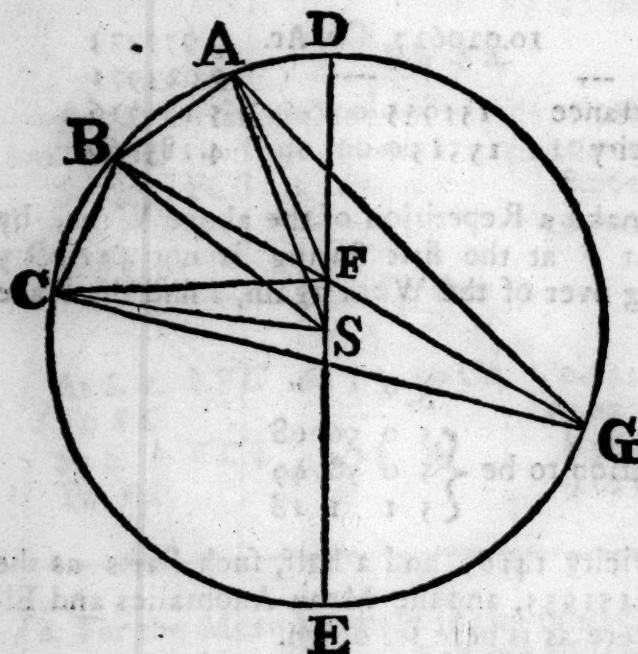
Example

Mean Anom.					Equar.			
S.	°	'	"		S.	°	'	
1---6	2	28	10	A	0	31	9	add. Double $\angle S A F$
2---8	1	45	57	B	9	53	3	add. $S B F$
3---9	18	45	48	C	9	40	48	add. $S C F$

Example 2. By three Oppositions of the Sun and *Jupiter* observed at *London*, the Anomalies, Aphelions, and Eccentricity of *Jupiter* is requir'd?

		D. h. ' "				Heliocent. Place $\angle$			
Anno						S.	°	'	"
1721	April 9	10	33	25	A	7	0	41	34
1722	May 11	8	55	30	B	8	1	18	10
1723	June 14	3	49	13	C	9	3	21	24

With any convenient Radius sweep the Diameter, and



draw the Diameter D F S E, which shall represent the Aphelial Line of *Jupiter* in the first, second and third Observations, from which draw Lines to S, the Sun, and also to F, the other Focus of *Jupiter's* Ellipsis; continue B F to G, and draw the other Lines as in the Scheme; then by the So-

lution of the several Triangles, as has been shewn in *Mars*, and by repeating the Work, and correcting the Angle FAS, FBS, FCS, I have at last found.

Mean

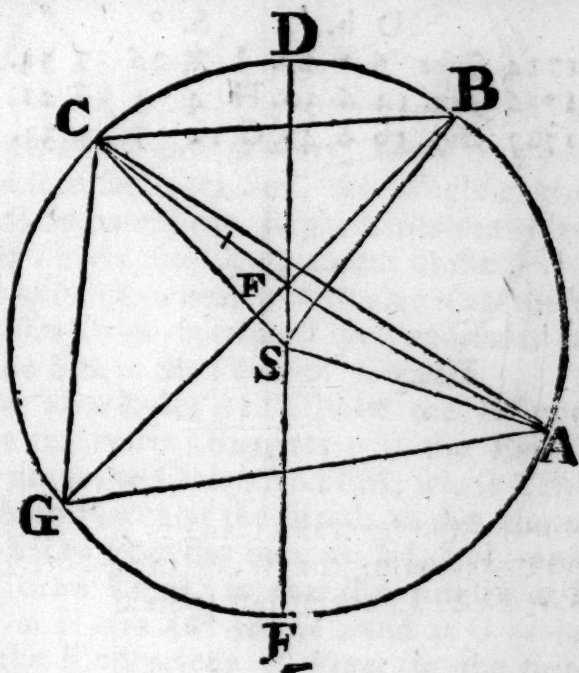
Mean Anom.	Aphelions.	Equations.	
S. ° ' "	S. ° ' "	° ' "	
1. 0 22 43 31.	6 9 59 20.	A 2 1 17 sub.	} Eccen- tricity 25074 $\frac{1}{2}$
2. 1 25 42 7.	6 10 00 38.	B 4 24 35 sub.	
3. 2 28 49 57.	6 10 01 58.	C 5 30 31 sub.	

such Parts as the Mean Distance of $\mathcal{U}$ à $\odot$ is 519995.

Example 3. By three Oppositions of the Sun and Saturn observ'd by me at London, I determin'd the Anomalies, Aphelions and Eccentricities, as follows.

	D. h. ' "	Heliocentr. Pl. $\mathcal{U}$.
Anno		S. ° ' "
1714, Febr. 15 11 25 14.		A 5 8 3 35
1720, May 1 5 28 0.		B 7 22 1 19
1727, July 24 9 33 0.		C 10 11 47 59

With any convenient Radius draw the Circle, and the Diameter DE, which shall represent the Aphelial Line of Saturn, A B and C the Places of Saturn in the first, second and third Observations; from which Lines to S the Sun, and also to F the other Focus of the Ellipsis, continue BF to G, and draw the other Lines, as in the Figure; so shall SA, SB, SC represent the transverse Diameter of the Ellipsis. Then by the Solution of the several Triangles, and by repeating the Work, correcting the Angles, &c. I have at last found.



Mean

Mean Anom.				Aphelion				Equat.			
S.	°	'	"	S.	°	'	"	°	'	"	
1.	8	3	10	46.	A	8	28	32	9=6	0	40
2.	10	18	56	51.	B	8	29	00	26=4	4	2
3.	1	17	11	50.	C	8	39	10	6=4	33	57 sub.

Eccentricity 54376 in such Parts as the Mean Distance of Saturn from the Sun is 953309.

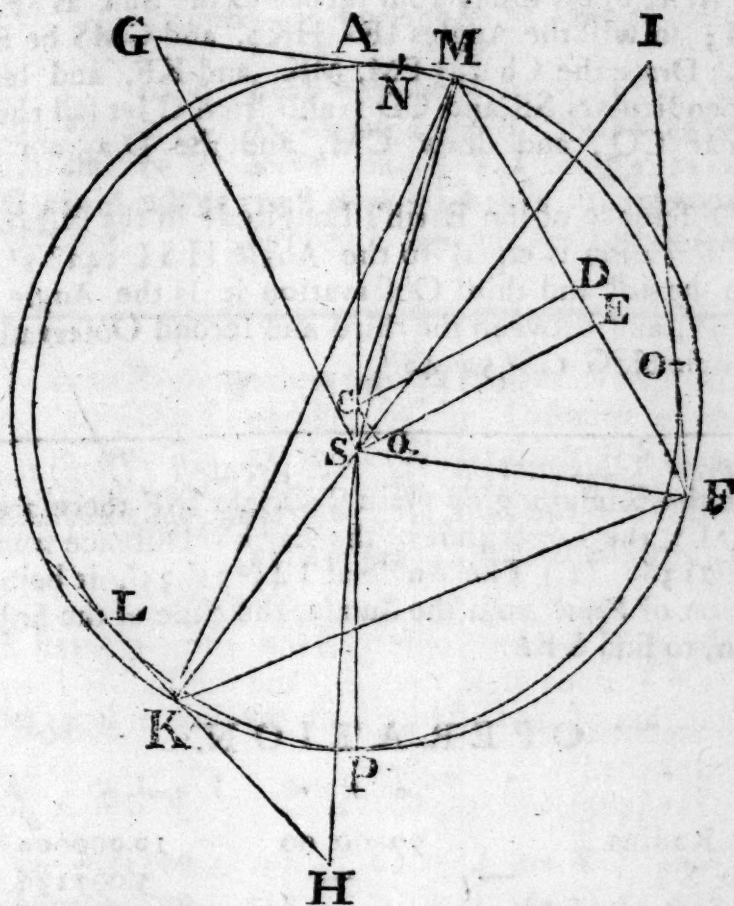
CHAP. V.

By three Observations of the greatest Elongations of Venus from the Sun, to determine the Mean Anomalies, Aphelions and Eccentricities.

Example. AT London I observed the three greatest Elongations of ♀ from ☉, and the Earth's Place, with its Logarithm of its Distance from the Sun to be as follows.

D. h. '				Pl. of Earth.				Log. à ☉		Elongat.	
				S.	°	'	"			°	'
1724	June	6	8	20.	I	8	26	37	54.	5.007136	45 21 31
1726	Jan.	13	6	30.	H	4	4	36	21.	4.993344	46 56 46
1727	Aug.	18	6	40.	G	11	5	45	33.	5.003836	46 8 54

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Sun's C
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Orbit o
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of Obse
SG; fr
may be
46° 8' 54"
second a
to the C



In the inferior Planets *Venus* and *Mercury*, when they are at their greatest Elongations from the Sun, the Angle at the Sun's Center, contained between the Right Lines drawn to the Earth and Planet, is nearly the Complement of the Elongation: and in Orbits which are nearly Circular (as these are) a Line touching the Orbit is almost perpendicular to the Line drawn from the Sun to the Point of Contact.

Now in the Figure above, let ALPON be the Elliptic Orbit of *Venus*, AP the transverse Diameter; to the Extremity of this Diameter draw the Circle AKPFM, whose Center is C; then to the three Places of the Earth at the times of Observation, draw Lines from the Sun, as SI, SH, and SG; from I, H and G, draw Lines, so that the Angles at I may be $= 45^{\circ} 21' 35''$, at H $= 46^{\circ} 56' 46''$, and at G $= 46^{\circ} 8' 54''$, which are the Elongations of *Venus* in the first, second and third Observations; they will become Tangents to the Orb of the Planet, and touch it in its Heliocentric Places

Places at O, L and N: Then where the said Tangent touches the Circle, draw Lines from thence to the Sun, as SF, SK, and SM; so will the Angles ISF, HKS, and GMS be Right Angles. Draw the Chords FM, MK, and KF, and let fall the Perpendiculars SE and CD: also from C let fall the Perpendicular CQ, and draw CM, and the Diagram is finish'd.

The Difference of the Earth's Longitude in the first and second Observation is equal to the Angle HSI $142^{\circ} 1' 33''$; between the first and third Observation it is the Angle GSI $69^{\circ} 7' 39''$, and between the third and second Observation it is the Angle HSG $148^{\circ} 50' 48''$.

1. In the Right-angled plain Triangle ISF there are given, (1.) IS, the Logarithm of the Earth's Distance from the Sun 5.007136. (2.) The Angle at I $45^{\circ} 21' 35''$, it being the Elongation of *Venus* from the Sun, at the time of the first Observation, to find SF?

OPERATION.

	o	'	"	
As Radius	90	00	00	10.000000
To SI	—	—	—	5.007136
So S. Angle SIF	45	21	35	9.852194
To SF	—	—	—	4.859330

2. In the Right-angled plain Triangle HK S there are given, (1.) HS the Logarithm of the Distance of the Earth from the Sun in the second Observation 4.993344. (2.) The Angle at H, it being the Elongation of *Venus* from the Sun $46^{\circ} 56' 46''$, to find SK?

OPE.

OPERATION.

As Radius	90° 00' 00"	10.0000000
To SH	=	4.993344
So S. $\angle$ SHK	46° 56' 46"	9.863746
To SK	=	4.857090

3. In the Right-angled plain Triangle GMS , there are given, (1.) The Logarithm of the Distance of the Earth from the Sun in the third Observation = SG 5.003836. (2.) The Angle at G , it being the greatest Elongation of *Venus* from the Sun $46^\circ 8' 54''$, to find SM ?

OPERATION.

As Radius	90° 00' 00"	10.0000000
To SG	=	5.003836
So S. $\angle$ SGK	46° 08' 54"	9.858017
To SM	=	4.161853

4. In the Triangle SFM are given, (1.) The Logarithm of SM found in the third hereof. (2.) The Logarithm of SF found in the first hereof. (3.) The $\angle FSM$ $69^\circ 54' 58''$, as will be shewn below, to find the Angles at F and M , and the Side FM ?

OPERATION.

As the lesser Side SF	4.859330
To the greater SM	4.861853
So Radius	90° 00' 00"
To $\angle$ of	45° 09' 59"
Sub.	45° 00' 00"
Remains	90° 09' 59"

E

Now,

Now, to find the Angle FSM, observe the following Steps.

O P E R A T I O N.

o ' "
 HSG 148 50 48
 GSM 43 51 6 Compl. of ♀ Elong. at 3d Observ.

 HSM 192 41 54
 From 360 00 00

 HSM 167 18 06
 HSI 142 01 33

 MSP 25 16 33
 FSI 44 38 25 Compl. of ♀ Elong. at 1st Observ.

 FSM 69 54 58
 From 180 00 00

 ZLLatM&F 110 05 02
 Half 55 02 31

Now say,

As Radius, or r , of	45 0 0	10.000000
To r , of the remaining Arch	0 9 59	7.462964
So r , half Z $\angle$ $\angle$	55 2 31	10.155450
Tot. half their X	0 14 17	7.618414

 Z is the $\angle$ SFM 55 16 48
 X is the $\angle$ SMF 54 48 14

For FM.

As S. $\angle$ SFM 55° 16' 48	Co. Ar.	0.085157
To SM	----	4.861853
So S. $\angle$ FSM 69 54 58		9.972753
To FM 83 13 1		4.919763

5. In the Triangle SKM are given, (1.) The Logarithm of SK , as found in the second hereof. (2.) The Logarithm of SM , as found in the third. (3.) The Angle KSM $149^{\circ} 38' 40''$, to find the Angles, and the Side KM ?

OPERATION.

As the lesser Side KS		4.857090
To the greater SM	---	4.861853
So Radius	$90^{\circ} 00' 00''$	10.000000
To $\angle$ of	45 18 50	10.004763
Sub.	45 00 00	
Remains	00 18 50	

	0 ' "
HSM	192 41 54
HSK	43 3 14
KSM	149 38 40
From	180 00 00
$Z \angle \angle =$	30 21 20
Half =	15 10 40

As Radius, or $t.$ of	45 00 00	10.000000
To $t.$ of remaining Arch	00 18 50	7.738570
So $t.$ half $Z \angle \angle$	15 10 40	9.433413
To $t.$ half X	00 05 06	7.171983

Z is the $\angle SKM$	15 15 56
X is the $\angle SMK$	15 05 34

For KM .

As $S. \angle SKM$	$15^{\circ} 15' 56''$	Co. Ar.	0.579561
To SM	---		4.861853
So $S. \angle KM$	30 21 20		9.703604
To KM	139642		5.145018

6. In the Triangle FSK, are given, (1.) S F. as found in the first. (2.) The Logarithm of SK, as found in the second. (3.) The Angle KSF $40^{\circ} 26' 22''$, as will be shewn below ; to find the Angles at F and K, and the side KF.

OPERATION.

As the lesser side S K		4.857090
To the Greater S F		4.859330
So Radius	$90^{\circ} 00' 00''$	10.000000
To t. of the Arch	$45^{\circ} 08' 52''$	10.002240
Sub.	$45^{\circ} 00' 00''$	

Remains $00^{\circ} 08' 52''$

HSI $142^{\circ} 01' 33''$
 HSI + $43^{\circ} 03' 14''$

KSI $185^{\circ} 04' 47''$
 ISF — $44^{\circ} 38' 25''$

KSF $140^{\circ} 26' 22''$
 From $180^{\circ} 00' 00''$

Z $\angle$ L $39^{\circ} 33' 38''$
 Half $19^{\circ} 46' 49''$

As Radius or t.	$40^{\circ} 00' 00''$	10.000000
To t. of remaining Arch	$00^{\circ} 08' 52''$	7.411150
So t. half Z $\angle$ L	$19^{\circ} 06' 49''$	9.555859
To t. half X	$00^{\circ} 03' 13''$	6.967009

Z $\angle$ SKF $19^{\circ} 50' 02''$
 X $\angle$ SFK $19^{\circ} 48' 36''$

For K F.

As S. $\angle$ SFK	$19^{\circ} 43' 36''$	Co. Ar.	0.471683
To SK	—		4.857090
So S. $\angle$ KSF	$39^{\circ} 33' 38''$		9.804067
To KF	135781		5.132840

7. In

subtract the Sum of the first two Logarithms from the Sum of the last two, and take half this remaining Logarithm, adding Radius, and it shall be the Tangent of half the Angle sought.

See the Work.

MK	139642
FK	135781
MF	83131
Z	358554
Half	179277

MK	139642	FK	135781	MF	83131
Half Z	179277	Half Z	179277	Half Z	179277
Diff. 1.	39635	X. 2.	43496	X. 3.	96146

Half Z	179277	—	5.253524	X. 2.	43496.	—	4.638449
X. 1.	39635	—	4.598079	X. 3.	96146.	—	4.982931
		Z	9.851603			Z	9.621380
		Z	9.621380				

Rem. 19.769777

Half = 9.8848885 t. of 37° 29' 34"

Doub. is = ∠ MFK 74 59 08

A third Method to find an Angle, by having the three sides given.

Rule. From half the Sum of the three sides, subtract the side opposite to the Angle requir'd, and note the Remainder; then to the Co. Ar. of the two sides, including the required Angle, add the Logarithm of half the Sum of the sides, and the Logarithm of the Remainder; half the Sum of these four Logarithms will be the Co. Sine of half the required Angle.

Opera-

Operation for the Angle F in the last Figure.

FK	135781	} Add.
MF	83131	
MK	139642	

Z	358554
Half	179277
MK	139642

Rem. 39635

FK	135781	Co. Ar.	4.867161
MF	83131	Co. Ar.	5.080237
Half Z	179277		5.253447
X	39635		4.598079

Sum Logarithms	19.798924
Half is C S. of $37^{\circ} 30' 3''$	9.899462
Double = $\angle F 75^{\circ} 00' 6''$	9.899467

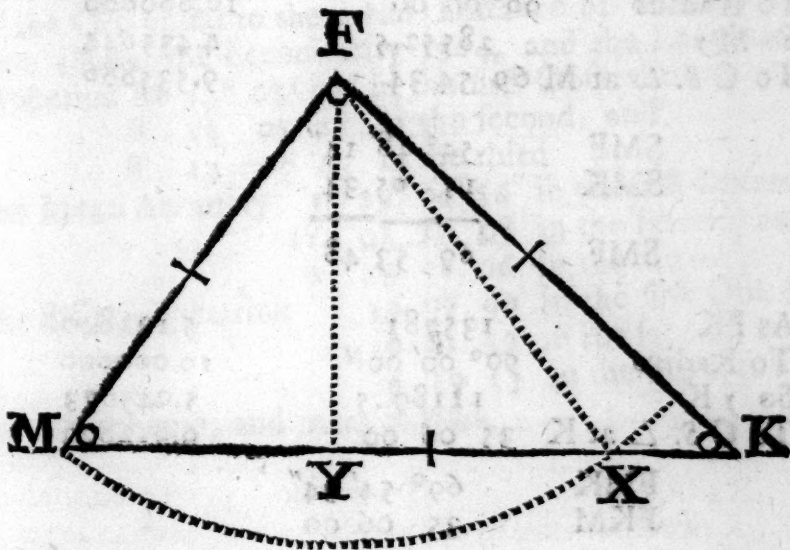
8. In the Right-angled Triangle SEF are given, (1.) The side SF, as found in the first. (2.) The Angle SFE $55^{\circ} 16' 48''$, as found in the fourth; to find SE and FE?

As Radius	$90^{\circ} 00' 00''$	10.000000
To SF		4.859330
So S. $\angle$ SFE	$55^{\circ} 16' 48''$	9.914843
To SE	59453	4.774173

As Radius	$90^{\circ} 00' 00''$	10.000000
To SF		4.859330
So S. $\angle$ FSE	$34^{\circ} 43' 12''$	9.755544
To FE	41197	4.614874

7. In the Triangle FMK, are given, (1.) The Side FM 83131. (2.) The Side KM 139642. (3.) The Side KF 135781, that is, all the Sides, to find the Angles; and falls under the third Axiom of Oblique-angled plain Triangles.

I shall here shew three several Ways of solving this Triangle; and first by the common Method. And that the Reader may have a better Idea of the Performance, I shall take the Triangle FMK out of the fundamental Diagram, and lay it down, as in the Margin, to prevent a Confusion of Lines.



OPERATION.

FK	135781
MF	83131
Z	218912
X	52650

E 3

Now

MF

Now say;

As MK the longest Side	139642	Co. Ar.	4.854982
To Z of the other 2 Sides	218912		5.340270
So is their X	52650		4.721398
To x K the alternate Base	82537		4.916659
From MK	139642		

Remains Mx	57105
Half = My = yx	28552.5
+ x K	82527
Z = y K	111089.5

As M F	83131	4.919758
To Radius	90° 00' 00"	10.000000
So My	28552.5	4.455644
To C S. $\angle$ at M	69 54 34	9.535886

SMF	54° 48' 14"
SMK	15 05 34
SMF	69 53 48

As FK	135781	5.132840
To Radius	90° 00' 00"	10.000000
So y K	11189.5	5.045673
To C S. $\angle$ at K	35 06 00	9.912833

FMK	69° 54' 34"
FKM	35 06 00

Z	105 00 34
From	180 00 00
MFK	74 59 26

2. The second Operation may be wrought more expeditiously thus, viz. Take the Difference between the half Sum and each Side severally, and note the Differences with the Figures 1, 2, 3. Then take the Logarithm of the half Sum, and first Difference, and add them together; also add the Logarithms of the second and third Differences together; sub.

CHAP. VI.

BY three Observations of the greatest Elongations of *Mercury* from the Sun, I have found as follows.

	D. h. ' "	Place $\odot$.	Log. à $\odot$	Elongat.
		S. ° ' "	° ' "	° ' "
1724 Sept.	18 6 20	I 00 06 43 22	5.000059	25 30 49
1725 Febr.	21 5 27	H 5 14 09 05	4.996895	27 23 14
1726 Aug.	13 6 57	G 11 01 10 15	5.004322	27 09 34

By drawing the Figure (as directed in *Venus*) and solving the several Triangles, I have at last found, the Semidiameter of the Orb equal to the mean Distance of *Mercury* from the Sun 38262, the Eccentricity 7964, and the Longitude of the Aphelion $85.13^{\circ} 05' 04''$ in the first Observation:

8 13 05 25 in the second, and

8 13 06 43 in the third.

The Mean Anomaly $18.23^{\circ} 04' 56''$ in the first Observat.

11 01 20 08 in the second, and

0 13 16 06 in the third.

The Elliptic Equation 16 07 00 in the first Obs. sub.

9 11 59 in the second, add.

4 19 15 in the third, sub.

See the Scheme, and mark it well.

That

MF	83131
Half = DF	41565.5
EF sub.	41197
Rem. DE = CQ	368

9. In the Triangle CDM, are given (1.) The Side DM, it being half of Mf 41565.5. (2.) The Angle MCD, it being equal to the Angle fKM $35^{\circ} 9' 30''$, and consequently the Angle CMD is $54^{\circ} 50' 30''$; because the Angle at D is right; to find CM and CD?

As S. $\angle$ DCM	35 09 30	9.760306
To DM	41565.5	4.618733
So Radius	90 00 00	10.000000
To CM	72182	4.858433

the Semidiameter of the Orb, equal to the mean Distance of $\text{Q} \propto \odot$.

As Radius	90 00 00	10.000000
To CM	72182	4.858433
So S. $\angle$ CMD	54 50 30	9.912521
To CD sub.	59014	4.770954
SE	59453	
Rem. S Q	439	

10. In the Right-angled plain Triangle SCQ are given; (1.) SQ 368. (2.) SQ 439, to find SC, the Eccentricity and Aphelion?

As

The

As S Q	439	2.642465
To Radius	90° 00' 0"	10.000000
So S Q	368	2.567026
To $\angle$ CSQ=ASE	40 02 55	9.924561
$\angle$ FSE +	34 43 12	
Z $\angle$ ASF	74 46 07	
Sub. $\angle$ ISF	44 38 25	
Rem. $\angle$ ASI	30 07 42	
Earth's Place at I	8 26 37 54	
Aphelion A	9 26 45 36	
	0 . "	
	90 00 00	
CSQ	40 02 55	
SCQ	49 57 05	
As S. $\angle$ SCQ	49° 57' 5"	9.883945
To SQ	439	2.642465
So Radius	90 00 0	10.000000
To S C Eccentricity	573.5	2.758520

Hence the Semidiameter of the Orb equal to the mean Distance of φ à $\odot$ is cm , = cA 72182, the Eccentricity 573 and half, and the Longitude of the Aphelion $9^{\circ} 26' 45'' 36''$.

But raducing the curtate Distance to the true, and comparing these Observations with Mr. *Flamsteed's*, I find the mean Distance of φ à $\odot$ 72337, the Eccentricity 505, the Place of the Aphelion in the First Observation $10^{\circ} 6' 54' 29''$, in the second, $10^{\circ} 6' 56' 0''$, and in the third, $10^{\circ} 6' 57' 30''$; the mean Anomaly in the First Observation, $9^{\circ} 4' 57' 20''$, in the second, $4^{\circ} 13' 40' 43''$, and in the third, $11^{\circ} 16' 7' 36''$; the Elliptic Equation in the First Observation, $47' 47''$ add; in the second, $34' 56''$ subtract, and in the third, $11' 25''$ add.

The apparent times of the Eclipses were thus observ'd :

	D.	h.	'	"	
Beginning, Jan. 22	14	50	00		} P.M.
Middle	15	47	00		
End	16	43	08		
Digits	03	15	00		

Time by my System:

Beginning, Jan. 22	14	56	54	} Clocks too fast 14' 24".
Middle	16	00	02	
End	17	03	10	
Digits	03	32	51	

But by another Calculation of mine, from new Tables, founded upon Sir Isaac Newton's Theory of the Moon, it is thus :

Beginning, Jan. 22	14	56	45
Middle	15	53	19
End	16	49	53
Digits	03	08	18

Scientia Stellarum,

Beginning, Jan. 22	14	37	34
Middle	15	33	48
End	16	30	02
Digits	02	53	00

Weaver's Almanack.

Beginning, Jan. 22	14	40	52
Middle	15	41	48
End	16	42	44
Digits	03	16	48

Ladies Diary.

Beginning, Jan. 22	15	13
Middle	16	06
End	17	00
Digits	02	32

URANOSCOPIA

Tycho Wing, in *Coley's Almanack*, which, he says, is from *Sir Isaac Newton's Theory of the Moon*; but that is a mistake, because it is so vastly wide from Truth, that it will not bear the test.

He gives the same thus:

Beginning, Jan.	22	14	31	23
Middle		15	29	40
End		16	27	57
Digits		03	06	00

P. M.

Here we see such a Disagreement in the time of this Eclipse, given by several Authors above, that it is hard to be reconcil'd.

One tells us, his Numbers are from bright Tables, never yet made publick.

Another tells us, that his Calculations are from *Sir Isaac Newton's Theory of the Moon*; and therefore no body must question the truth of them. Indeed, if it were so, not any one living would dare to question them. But I deny the Assertion; and can prove, that his Calculation is not from *Sir Isaac Newton's Theory*.

CHAP.

CHAP. VII.

To determine the greatest Elongation of Mercury and Venus from the Sun.

THE Quantity of this Angle, that these two inferior Planets make at the Earth, is what was never yet (that I know of) truly determin'd, but always given in gross. All the Writers of Astronomy, both ancient and modern, only tell us, that *Mercury* is never more than 28 or 29° , and *Venus* never more than 48° from the Sun.

I shall therefore in this place shew the true Quantity of their Elongations, both the greatest and least that ever can happen.

I have in the foregoing Chapter determined the Eccentricity of *Mercury* to be 7964 of the same Parts, of which the mean Distance is 100000 . Now, because these Numbers are too large to be laid down by any Scale, I shall reduce them to such as may be laid down, thus :

Suppose the mean Distance of the Earth from the Sun to be 1000 , the Aphelial Distance will be found in that Proportion thus :

$$\begin{array}{l} \text{As } 101692 : 1000 :: 1692 : 16.6 \\ \text{Eccentricity} \quad 16.6 \end{array}$$

$$\text{Radius} \quad 983.4 \text{ of the Earth's Orb.}$$

2. For *Mercury's* Aphelial Distance reduced, say,

$$\text{As } 101692 : 1000 :: 46680 : 459.$$

3. For the Eccentricity of this reduced Orb, say,

$$\begin{array}{l} \text{As } 46680 : 7964 :: 459 : 78. \\ \quad \quad \quad 78 \end{array}$$

$$\text{Rem. Radius of } \text{\textcircled{M}} \text{'s Orb } 381.$$

Make

OPERATION.

As S $\odot$ Perihelion Distance	—	4.992589
To Radius	—	10.000000
So S $\oplus$ Aphelion	—	4.669131
To S. $\angle$ $\oplus$ $\odot$ S. Elongat.	28° 21' 8"	9.676542

2. For the least in the Second Triangle.

As S Earth's Aphelion	—	5.007286
To Radius	—	10.000000
So S $\oplus$ Perihelion	—	4.487704
To S. $\angle$ S $\odot$ $\oplus$ Elongat.	17° 35' 42"	9.480418

Secondly, To determine the greatest and least Elongation of *Venus* from the *Sun*.

When *Venus* and *Mercury* are at their greatest Elongation from the *Sun*, they move with equal pace with our *Earth* for a small time; and then a Line drawn from them severally to the *Earth* will be a Tangent to their Orbits respectively; so that looking into an Ephemeris that has their Motions to Minutes, you may discover the Day of their greatest Elongation from the *Sun*, by observing their equal pace with him. And by reason of the different Positions of our *Earth* at different times when these two Inferiours are at their greatest Elongation, this Quantity will be always different; but is greatest when the Planet is in Aphelion, and least when in Perihelion; because the Distance of the Planet from the *Sun* is the Side of the Triangle that subtends the Angle of Elongation, as is plain from the Demonstrations hereunto annexed.

In the foregoing Chapter I have found the Eccentricity of *Venus* to be 505, and her Aphelial Distance to be 72838 of such Parts as the mean Distance of *Sun* from *Earth* is 100000.

Now, to reduce these Numbers practicable on the Sector, I proceed as in *Mercury*.

F

As

As S Earth's Aphelion	—	5.007286
To Radius	—	10.000000
So S Venus's Perihelion	—	4.856295
To S. $\angle$ S $\odot$ $\oslash$ Elongat.	$44^{\circ} 56' 14''$	9.849009

So that *Venus's* Elongation is never more than $47^{\circ} 48' 35''$, nor less than $44^{\circ} 56' 14''$, in what part of its Orbit soever the Earth be.

I shall here set down the Days when *Mercury* is at his greatest Elongation this Year 1734, with the Sign he is in, and the Quantity of the Angle at the Earth.

1734. Jan. 8.	<i>Mercury</i> in <i>Capricorn</i> Orient.	24 36
Mar. 22.	<i>Mercury</i> in <i>Taurus</i> Occident.	19 2
May 8.	<i>Mercury</i> in <i>Taurus</i> Orient.	25 4
July 19.	<i>Mercury</i> in <i>Virgo</i> Occident.	27 17
Sept. 1.	<i>Mercury</i> in <i>Virgo</i> Orient.	17 44
Nov. 12.	<i>Mercury</i> in <i>Sagittary</i> Occid.	21 28
Dec. 23.	<i>Mercury</i> in <i>Sagittary</i> Orient.	23 5

And the same Year 1734, *Venus's* Elongat. Max. à $\odot$ falls thus :

Jan. 16.	<i>Venus</i> in <i>Pisces</i> Occid.	46 59
Mar. 4.	$\oslash$ in 22° γ	
June 2.	<i>Venus</i> in <i>Taurus</i> Orient.	45 53

Here follow the Calculations of *Venus's* Place in Jan. 1734, at the time when she is at her greatest Elongation from the Sun.

F 2

Equal

Equal Time.	Long. <i>Venus.</i> S. ° ' "	Anom. <i>Venus.</i> S. ° ' "	Node <i>Venus.</i> S. ° ' "
<i>Anno</i> 1734.	1 00 53 7	3 23 49 27	2 14 15 27
<i>January</i> 10.	16 01 18	16 1 17	16 1 17
Hours 6.	24 2	24 02	24 02
Mean Motion	1 17 18 27	4 10 14 56	2 14 15 28
Equation sub.	0 36 50		
Hel. Orb Place	2 16 41 37	Log. ☿ à ☉ Cur.	--- 4.857386
Node sub.	1 14 15 28	Log. ☉ à Earth.	--- 4.993176
Arg. Lat.	0 02 26 9	Tan. 36 11 07	--- 9.864210
Reduct. sub.	16	Add 45 00 00	
Hel. Ecl. Place	2 16 41 21	Cr. --- 81 11 07	--- 9.190531
Sun's Place sub.	10 01 35 34	t. --- 67 32 53	--- 10.383809
Angle at Sun	+ 15 05 47	t. --- 20 34 10	--- 9.574341
Half	1 07 32 53	Z 88 7 3½	Parallax. ---
Parallax sub.	2 28 07 32	X 46 58 43½	Elongat. +
Geocentr. <i>Venus</i>	11 18 34 17½	Elongation at	Noon was
Lat. N. A.	0 8 55		46° 58' 37"
Place of {	☿ 9 < at	☿ 10 0 19 19	☿ 11 17 17 35
	☿ 10 { Noon.	☿ 10 1 20 20	☿ 11 18 18 57
	Diurnal Moto	1 1 1	1 1 22

Note,

Note, If the Diurnal or hourly Motion of an inferior Planet be more than the Apparent Motion of the Sun, they are then short of the *Elong. Max.* ☉; but if less, past.

Here follows the Calculation of the Place of *Mercury* in the Evening of the Day of his greatest Elongation 1734; which, if it be clear, ☿ may be seen with the naked Eye a little after Sun-setting.

Equal Time.	Long. <i>Mercury</i> .	Anom. <i>Mercury</i> .	Node <i>Mercury</i> .
S.	S.	S.	S.
<i>Anno</i> 1734,	4 22 19 58	8 9 6 44	1 15 15 40
<i>July</i> 20,	3 12 34 5	3 12 33 37	27
<i>Hours</i> 8,	1 28 51	1 21 51	
<i>Min.</i> 30,	5 6	5 6	1 15 16 7
<i>Mean Motion</i>	8 6 21 0		
<i>Equation add</i>	2 14 49	11 2 7 18	
<i>Hel. Orb. Pla.</i>	8 8 35 49	☿ 2 ☉ in Orb.	- - 4.668762
<i>Node sub.</i>	1 15 16 7	<i>Curt. sub.</i>	- - 504
		☿ 2 ☉ in Ecl.	- - 4.668258
<i>Arg. Lat.</i>	6 23 19 42	☉ 2 <i>Earth</i>	- - 4.006292
<i>Reduct. sub.</i>	9 28	1. 24° 39' 46"	- - 9.661966
		+ 45 00 00	
<i>Hel. Ecl. Pla.</i>	8 8 26 31	<i>Gr.</i> 69 39 46	- - 9.568064
<i>Sun's Place</i>	4 8 13 14	1. 60 6 38 ½	- - 10 340000
		1. 32 48 58	- - 9.8 9464
<i>Angle at ☉</i>	4 0 13 17		
<i>Half</i>	2 0 6 38 ½	Z 92 55 36 ½	<i>Parallax</i> —
<i>Parallax sub.</i>	3 2 55 36 ½	X 27 17 40 ½	<i>Elongat.</i> +
<i>Geocen. ☿</i>	5 30 54 ½	<i>Elongation at</i>	<i>Noon was</i>
<i>Lat. S. Ascen.</i>	1 27 5		27° 18' 6"

Diurnal Motion of ☉ from 19 to 20th Day at Noon is 16", from 20 to 21 at Noon, is 17' 26", of ☿ 18' 43", and 55' 3". By which 'tis plain, the greatest Angle at Earth was on the 20 Day.

By my Planetary Instruments you may lay down the Triangles at the times above-mentioned, which will greatly inform you of the true Theory of them: And because Time (the common Devourer of all things) will render those Instruments to err in *Saturn* 1° in 45 Years, in *Jupiter* 1° in 50 Years, in *Mars* 1° in 51 Years and half, in *Venus* 1° in 63 Years, and in *Mercury* 1° in 70 Years: Therefore, for the sake of the Inquisitive, I will here subjoin a Table, by which new Instruments of all the Planets may be projected at pleasure, making the Aphelial Distance 1000.

The Aphelions of the Planets, according to my Tables.

<i>Saturn</i>	$\nearrow$	29	18	40	} The last Day of the <i>Julian</i> Year at Noon 1733.
<i>Jupiter</i>	$\nwarrow$	16	54	35	
<i>Mars</i>	$\nwarrow$	1	12	59	
<i>Earth</i>	$\vee$	8	19	11	
<i>Venus</i>	$\sim$	7	3	30	
<i>Mercury</i>	$\nearrow$	13	13	14	

Saturn 946 } Ra- } *Saturn's* Orb à Aph. Point to its Center,
Earth 100.84 } dius } *Earth's* Orb Center à ☉ is 1.67.

Jupiter 954 } Ra- } *Jupiter's* Orb à Aphel. Point to its Center.
Earth 186 } dius } *Earth's* Orb Center from ☉ is 3.

Mars 915 } Ra- } *Mars's* Orb à Aphel. Point to its Center.
Earth 611 } dius } *Earth's* Orb Center à ☉ is 11.

Earth 983.4 } Ra- } *Earth's* Orb à Aphel. Point to its Center
Venus 716 } dius } *Venus's* Orb Center à ☉ is 5.

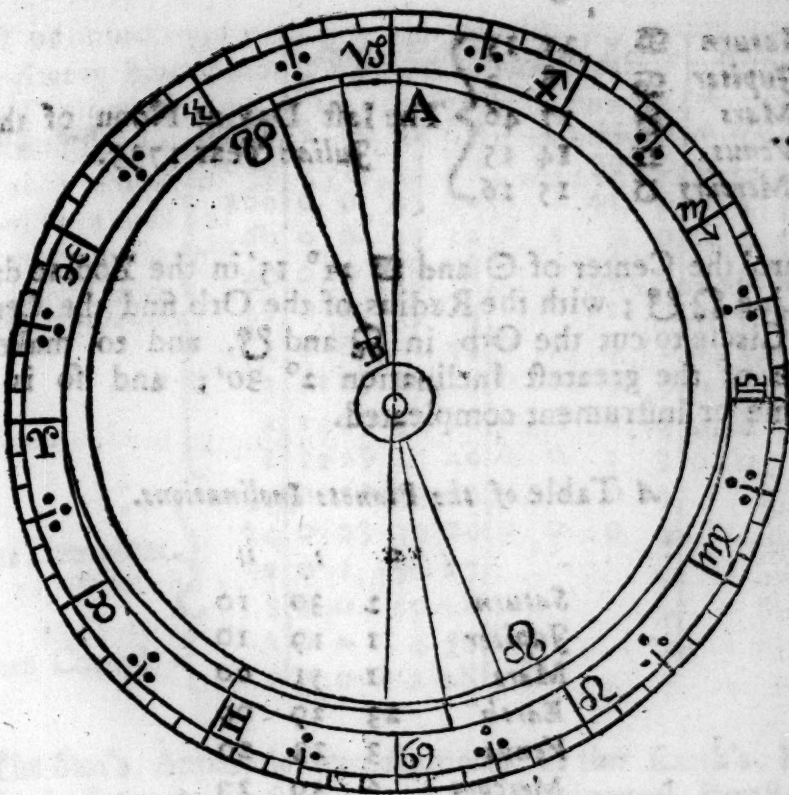
Earth 983.4 } Ra- } *Earth's* Orb à Aph. Point to its Center.
Mercury 459 } dius } *Mercury's* Orb Center à ☉ is 78.

Or in *Venus* $716 - 5 = 711$, the Radius of her Orb; and in
Mercury $459 - 78 = 381$, the Radius of his Orb.

Then to delineate the Instrument of *Saturn*, on the Center ☉ sweep a Circle, and divide it into 12 Signs, as per Figure.

From ☉ draw a Line to the Place of this Aphelion $29^{\circ} 19'$, which shall represent the Aphelial *Saturn*.

Thro'



Thro' ☉ draw a Line from the Place of the Earth's Aphelion $\text{VS } 8^{\circ} 19'$, and it shall represent the Aphelial Line of the Earth.

Take the Radius of the Zodiac, and open the Sector to 10 on the Line of Lines; as the Sector now stands, take off 946 in your Compasses, and set it on *Saturn's* Aphelial Line from A towards ☉, and draw the Orb of *Saturn*.

Then take 109.84 (nearly 101) and set it from ☉ on the Aphelial Line of ☿ to B: Take 1,67 from the same Line of the Sector, and set it from ☉ towards B, and it shall give the Center of the Earth's Orb as before; which Circle draw as is done in the Scheme, and that shall be the Earth's Orb truly proportion'd to the Orb of *Saturn* in his Theory.

The next thing to be done, is to draw the Ecliptic, which must be done from this Table of the Places of their Nodes.

Saturn

Saturn	♄	21	15
Jupiter	♃	8	2
Mars	♂	17	46
Venus	♀	14	15
Mercury	♿	15	16

The last Day at Noon of the
Julian Year 1733.

Thro' the Center of ☉ and ♄ 21° 15' in the Zodiac draw the Line ♄☉; with the Radius of the Orb find the Center of a Circle to cut the Orb in ♄ and ☉, and to make an Angle of the greatest Inclination 2° 30'; and so is the Scheme or Instrument completed.

A Table of the Planets Inclinations.

	°	'	"
Saturn	2	30	10
Jupiter	1	19	10
Mars	1	51	00
Earth	23	29	00
Venus	3	23	20
Mercury	6	59	20
Moon	5	17	20

CHAP. VIII.

I. Of the Mean Motion of the Earth, her Aphelion, and the Recession of the Equinox, &c.

THE last Day of December at Noon, under the Meridian of London 1700, Old Stile, the mean Place of the Earth was 3^s. 20° 43' 50'', the Place of the Aphelion was 9^s. 7° 44' 30'', and the Place of the first Star of Aries was 29° 0' 10''. To which I shall prefix the middle Motions for Years compleat, as below.

		Long. Earth.				Apbel. Earth				Recession.		
		S.	°	'	"	S.	°	'	"	S.	°	"
Radix Anno	1701	3	20	43	50	9	7	44	30	0	29	0 10
	1000	0	7	33	20	0	17	30	0	0	13	53 20
	100	0	0	45	20	0	1	45	0	0	1	23 20
	60	0	0	27	12	0	1	3	0	0	0	50 0
	40	0	0	18	8	0	0	42	0	0	0	33 20
Year Compleat	20	0	0	9	4	0	0	21	0	0	0	16 40
	4	0	0	1	49	0	0	4	12	0	0	3 20
	3	11	29	17	0	0	0	3	9	0	0	2 30
	2	11	29	31	20	0	0	2	6	0	0	1 40
	1	11	29	45	40	0	0	1	3	0	0	0 50
	30	0	29	34	10	0	0	0	5			4
Days Compleat	24	0	23	39	20	0	0	0	4			3
	2	0	1	58	17							
	1	0	0	59	8							
Hours Compl.	2	0	0	4	56							
	1	0	0	1	2 28							

The Sun's Apparent Semidiameter at the Earth's Mean Distance from it is $16' 5''$, and the Horizontal Parallax of the Sun, for the Smallness of the Eccentricity of the Earth's Orb, and the Smallness of its own Quantity, may be always stated $10''$.

2. To Calculate the Mean Place of the Earth, and her Apbelion, and thence the Mean Anomaly, to any given Time.

1. If the given Time be after the Year 1701, take the Mean Place for 1701 Current, from the foregoing Table, which I call the *Radix*.

2. To the Radical Place, add the Mean Motions for the Years, Months, Days, Hours, Minutes and Seconds Compleat, this Sum is the Mean Motion, or Place sought.

N. B. The true Length of the Solar Year being 365 D. 5h, 49' 2" 15", the Mean Motion of the Earth to any Months and Days may be known, by saying, If the Length of the Solar Year give 360° , What will the Days from the first of January, to the Day proposed, give? (For this purpose, see the

the Table in my *Satellite Astronomy*, Page 94.) And for the Mean Motion of the Aphelion, to any Day in the Year, say, As the Length of the Solar Year 365 D. 6 h. 49^l 2^l 15^l To 63", So are the Days from the first of *January*, to the Day proposed, To the Motion of the Earth's Aphelion: Minding in Leap-Year to add the Motion of a Day more.

Lastly, Subtract the Mean Place of the Aphelion, from the Mean Longitude of the Earth, and there will remain the Mean Anomaly.

Note, If the Time be before 1701, subtract the Mean Motion from the Time proposed, to 1701, from the Radical Place; then work as before is taught.

Example. Let it be required to find the mean and true Place of the Earth, her Aphelion and Mean Anomaly for *April 29*, at Noon, in the Year 1726?

First, The Days from the first of *January*, to *April 29*, inclusive, are 119 Days. Then,

D. h. ' " " " • D. S. ° ' " "

As 365 5 49 2 15 : 360 : 119 : 3 27 17 32 Long.

And As 365 . 49 2 15 : 63. :: 119 : 20".

Now see the Work.

		Longit. Earth.				Aphel. Earth.			
		S.				S. ° ' "			
Radix	1701	3	20	43	50	9	7	44	30
	20	0	0	9	4	0	0	21	00
Years	4	0	0	1	49			4	12
	1	11	29	45	40			1	03
April	29	3	27	17	32				20
Mean Place Earth		7	17	57	55	9	8	11	05
Aphelion sub.		9	8	11	5				
Mean Anomaly		10	9	46	50				

3. Given the Earth's Mean Anomaly, to find the Angle at the upper Focus of the Earth's Ellipsis.

To

To the Constant Logarithm 89.3909656, add the Sine of twice the Mean Anomaly; the Sum will be the Logarithm of the Decimal Parts of a Minute; which being subtracted from the Mean Anomaly in the first and fourth Quadrants of the Orb, but added in the second and third, gives the Angle at the upper *Focus*.

Example. Let it be required to find the Angle at the upper *Focus* in the foregoing Case, where the Mean Anomaly is $10^{\circ} 9' 46'' 50''$?

O P E R A T I O N.

	S.	°	'	"	
Mean Anom. <i>Earth</i>	10	9	46	50	
Double	8	19	33	40	
Complement		79	33	40	Sine 9.9927517
Constant Logarithm				----	89.3909656
The Logarithm of		24	19		99.3837173
			60		

	Seconds	14,5140	subtr.
Mean Anomaly		10 9 46 50	
Angle at upper <i>Focus</i>		10 9 46 35	

4. Given the Angle at the upper *Focus*, to find the true Anomaly, and so the Earth's Place in her Orbit, and consequently the Sun's Place in the Ecliptic.

To the Constant Logarithm 9.9852994, add the Tangent of half the Angle at the upper *Focus*, and you will have the Tangent of half the true Anomaly.

And here observe, that if the half of the Angle at the upper *Focus* be more than a Quadrant, then take the fourth proportional Tangent from 180° , and the double of the Remainder is the true Anomaly.

Then to the true Anomaly add the Place of the *Aphelion*, and you have the Earth's true Place in her Orbit; to which add Six Signs, and you will have the Sun's true Place in the Ecliptic.

Ex.

Example. Let the Sun's Place be required to the time above, when the Angle at the upper Focus was $105^{\circ} 46' 35''$?

O P E R A T I O N.

	S.	°	'	''		°	'	''
Angle at the upper Focus	10	9	46	35	Compl.	50	13	25
Half	5	4	53	17.5				
Complement	0	25	6	42.5	r.	9.6708815		
Constant Logarithm						9.9852934		
Sum, is the Tangent of	24	22	27			9.6561749		
From	180	0	0					
Rem. half true Anom.	155	37	33					
True Anomaly	311	15	6	= 10	11	15	6	
Aphelion add					9	8	11	5
Earth's true place					7	19	26	11
Add					6	2	0	0
Sun's true place					1	19	26	11

5. To find the Elliptic Equation

The Difference between the Mean Anomaly and the True, is the Elliptic Equation, which is to be subtracted from the Mean Longitude in the Six first Signs of Mean Anomaly, and added in the other Six; the Sum or Difference is the true Place of the Earth: So in the preceding.

	S.	°	'	''
<i>Example,</i> the Mean Anomaly is	10	9	46	30
The true Anomaly is	10	11	15	6
Elliptic Equation add	1	28	16	

After this manner is the Sun's Equation in the Table of my *Compleat System*, Pages 28, 29, Calculated.

Mean

	S	°	'	"
Mean Longitude of the Earth	7	17	57	55
Ecliptic Equation add		1	28	16
Earth's true Place as before	7	19	26	11

6. Given, the Angle at the upper *Focus*, and the true Anomaly, to find the Logarithm of the Distance of the Earth from the Sun; supposing the Logarithm of the mean Distance to be 10.0000000. = AC = CP = QG in the Scheme, Page 15.

Rule Take the Sum and Difference between the true Anomaly and the Angle at the upper *Foces*, and also the half of the Sum and Difference; then to the Sine of the Angle at the upper *Focus* add the Excess of the Co-Secant above the Radius of the half Sum found above, and the Secant above the Radius of the half Difference; the Sum of these three will be the Logarithm of the Distance of the Earth from the Sun sought.

But to have it agree to the Mean Distance of 100000. as in my Solar Tables in my *System*, take half of the Characteristic, and 'tis done. Let the Example be as above.

	S	°	'	"	
True Anomaly	10	11	15	6	
Angle at upper Focus	10	9	46	36	Sine 9.885650
Sum	8	21	1	41	
Half	4	10	30	50	Co-Sec. 0.119061
Difference		1	28	31	
Half		0	44	15	Sec. 0.000056
The Logarithm Distance Sought = QK					10.004747
Half Charact. is Logarithm in my Tables					5.004747

But when the Earth is very near her Aphelion, to the Constant Logarithm 85. 1748215 add twice the Sine of half the Angular Distance of the Earth from her Aphelion, and you will have the Logarithm of a Number, which taken from the Constant Logarithm 10.007289, gives the Logarithm-Distance sought.

Example. June 18, 1732 at Noon, the Sun's Place is in $9^{\circ} 48' 8''$ and the M. Anom. $11^{\circ} 29' 29'' 36''$
Earth's Distance from the Aphelion $30 \ 24$

Half

15 12 Sine 7.645423

Double Sine

15.290846

Constant Logarithm add

85.174822

Subtract

3

0.465668

Constant Logarithm

10.007289

Dist. $\odot$ a $\odot$ as in my Tables

5.007288

2. And when the Earth is very near (or within 5° of) her Perihelion, then to the Constant Logarithm 85.1599111 add twice the Sine of half the Angular Distance from the Perihelion, and you will have the Logarithm of a Number; which added to the Constant Logarithm 9.992587, gives the Logarithm-Dist sought.

Then take half the Characteristick, and it will be the Logar. Dist. $\odot$ a $\odot$ in my Solar Table.

Example December 18, 1732, at Noon, the Earth's Place is $58^{\circ} 9' 14''$ and her mean Anom. $58^{\circ} 29' 51'' 26''$; what's the Logarithm of her Distance from the Sun?

O P E R A T I O N.

Mean Anomaly

5 29

51

26

Distance from the Perihelion

8

34

Half

4

17

Sine 7.076577

Double Sine

14.153154

Constant Logarithm

85.159911

And the Number

2

313065

To the Constant Logarithm

9.992587

Dist. $\odot$ from $\odot$

9.992589

Nearest half Characteristick

4.992589

in my Tables.

7. Given, the Logarithm Distance of the Earth from the Sun, to find the apparent Semidiameter of the Sun?

Rule.

Rule. From the Constant Logarithm 11.2063672, take the Logarithm Distance of the Earth from the Sun, and the Remainder is the apparent Semidiameter in Minutes and Decimal Parts.

Example. Anno 1726, April 29, at Noon, I demand the Sun's apparent Semidiameter?

OPERATION.

Constant Logarithm	----	11.2063671
Logarithm of Earth from Sun sub.		10.0047470
Sun's Semidiameter	15' 91	1.2016201
	60	

$$54\ 60 = 15' 55''$$

Example 2. Anno 1732, June 18, Const. Logar.	11.206367
Logarithm-Distance Earth from Sun	10.004286
Suns Appar. Semidiameter	15' 81
	60

$$15\ 48\ 60 = 15' 49''$$

Example 3. Anno 1732, June December 18, Const.	
Logarithm	11.206367
Logar. Dist. Earth from Sun sub.	9.992589
Sun's Appar. Semidiameter	16' 36
	60

$$21\ 60 = 16' 22''$$

8. Given, the Logarithm-Distance of the Earth from the Sun, to find the Apparent hourly Motion of the Sun.

Rule, From the Constant Logarithm 20.3116407 subtract twice the Logarithm-Distance of the Earth from the Sun, and the Remainder will be the Logarithm of the Apparent hourly Motion of the Sun in Minutes and Decimal Parts.

Example. Anno 1726, June 29, at Noon.

Constant

Constant Logarithm	20.3916407
Twice Logar. Dist. Earth from Sun Sub:	20.0094940
Sun's Appar. hourly Motion	2'.411
	60
	0.3821467

$$24.660 = 2' 25''.$$

Example 2. Let the Sun's true place, his hourly Motion and Apparent Semidiameter be sought *February 14, 1732 at Noon*; Because 'tis Leap Year, the days from *January 1, to February 15 Inclusive* are 46.

D. h. ' "	11 "	D. S. ° ' "	15 "
As 365 5 49	2 15 : 3600 :: 46 : 1	15 10 23	Longitude;
As 365 5 49	2 15 : 63' :: 46 :	7	Apogeeon.

Now

Now see the Work; and mark it well.

		Long. Earth	Aph. Earth	Conf.
		S. ° ' "	S. ° ' "	
Radix	1701	3 20 43 50	9 7 44 30	11.2063671
				9.9959882
				16.23 1.2103791
				60
Years	4	0 00 01 49	4 12	13.80
Complet	3	11 29 17 00	3 9	☉ Sem. 16' 14"
	2	11 29 31 20	2 6	
	1	11 29 45 40	1 3	Conf. 20.3916407
	1	11 29 45 40	1 3	Sub. 19.9919760
Feb. 14. Bissextile	1	15 20 23	7	2.51 0.3996647
Mean Place Earth	5	04 34 46	9 8 17 10	60
Aphelion sub.	9	08 17 10		30.60
Mean Anomaly	7	26 17 36		Hor. Mot. 2' 31"
Doubled	3	22 35 12		
Complement	2	07 24 48	Sine —	9.9653426
Equ add to M. Ano.		14	Const. Log.	89.3909656
∠ at upper Focus	7	26 17 50	2272	89.3563082
			60	
Half	3	28 8 55	13.6320	Equat. add.
Complement	2	1 51 51	10.2716129	
Constant Logar.			9.9852934	
Tangent sub.	61	2 12	10.2569063	
From	180	0 0		
		118 57 48	75.27° 55' 36"	True Anom.
	30)	237 55 36	9 8 17 10	Apog. add.
Elliptic Equat. add	10	38'	☉ 5 6 12 46	true Place.
			☉ 11 6 12 46	
True Anom	75.27° 55' 36"			
∠ at up. Focus	7	26 17 50	Sine	9.9200853
X	3	24 13 26		.0758588
X half	1	27 6 43	Co. Sec.	.000439
Half	1	37 46		
Half	48	53	Sec. 4.9959880	Log. ☉ 2 ☉

CHAP. IX.

To Calculate the true Place of the Moon more exact than was ever yet done.

1. **BY** the last Chapter, (or by the Fourth Precept of my *Compleat System*) find the Sun's true Place to the Equal Time given, with the Logarithm of its Distance from the Earth.

2. To the same Time, collect the middle Motions of the Moon's Longitude, Apogee and Node, from the Tables in my *Satellite Astronomy*, as is usually done.

3. With the Mean Anomaly of the Sun, enter the Table of the Annual Equations of the Moon; and take out the Equations of the Moon's Longitude, Apogee and Node, which apply to the mean Place of the Moon above found, as the Tables direct, and you will have the middle Places of the Moon's Longitude, Apogee and Node clear'd off the Annual Equations.

4. From the Place of the Sun, subtract the Place of the Moon's Apogee first Equated, and the Remainder is the Annual Argument; with which enter the Table of Equation the Second, and there take out the second Equation of the Moon; which applying to her Place first Equated, gives her Place the second time Equated.

5. From the Place of the Sun, take the Place of the Moon's North Node first Equated; and this Remainder is the Annual Argument of the Node. With this take out the third Equation, and apply it to the Moon's Place, the second time Equated, gives her Place Equated the third time.

6. From the Place of the Sun, take the Place of the Moon the third time Equated. And from the Place Sun's Apogee, take the Place of the Moon's Apogee the first time Equated; the Sum of these two Remainders call the

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Argument of the fourth Equation; with this enter the Table of the Fourth Equation; and that answering, apply to the Moon's Place the third time equated, gives her Place the 4th time Equated.

7. With the annual Argument (as found in the Fourth hereof) enter the Table, entituled *A Table of the Second Equation of the Moon's Apogee, and Logarithm of the Eccentricity of her Orb.*, and there take out the Second Equation, which apply to the Apogee first Equated, gives its Place Equated the second time, which is its true Place.

Also out of the same Table take the Logarithm of the Eccentricity, and reserve it till anon.

8. From the fourth Equated Place of the Moon, subtract the true Place of the Apogee, and the Remainder is the Moon's Mean Anomaly at that time.

9. To find the *Angle* at the upper Focus of the Ellipsis.

1. To the Constant Logarithm 72,933542, add twice the Logarithm of the Eccentricity, and the Sine of twice the Mean Anomaly, and you will have the Logarithm of some Minutes, which shall

be $\left\{ \begin{array}{l} \text{added to} \\ \text{subtracted from} \end{array} \right\}$ the Mean Anomaly, when its Double

is $\left\{ \begin{array}{l} \text{less} \\ \text{greater} \end{array} \right\}$ than 6 Signs.

2. To the Constant Logarithm 43 359870 add thrice the Logarithm of the Eccentricity, and thrice the Sine of the mean Anomaly, and you will have the Logarithm of some Minutes to be added to the mean Anomaly, if less than 6 Signs; but to be subtracted, if more; the Sum or Difference is the Angle at the upper Focus of the Ellipsis, which the Moon's Orb forms at that time.

Note, In the first of these, the Characteristick will generally be more than 100, which always reject, and enter the Table of Logarithms with 0 for the Characteristick, and then the Minutes will be under 10: But in the second Part it is the Logarithm of the Decimal of a Minute. See these two Examples;

G 2

N.B;

N. B. Always put two Cyphers before the second, as per Work.

	Logar.	Logar.
1507+	0.178114	2.6+ — 3.414839
.006—	97.801979	.007+ 96.843904
Min. 1.501+		2.607+
60		x 60
Second, 30.360		56.420

10. Seek the Logarithm of the Eccentricity in the Table of Artificial Tangents, and subtract its corresponding Arch from 45° , and to the Tangent of the Remainder add the Tangent of half the Angle at the upper Focus, and you will have the Tangent of half the true Anomaly.

Note, When the half of the Angle of the upper Focus is more than a Quadrant, then take the fourth proportional Tangent from 180° , and the double of the Remainder is the true Anomaly. The Focus of the Ellipsis of the Moon is shewn in the Scheme, Page 15.

11. To the true Anomaly add the true Place of the Apogee, and that gives the Place of the Moon the fifth time Equated. Or, take the Difference between the mean Anomaly and the true, and you have the Elliptic Equation; which apply to the fourth Equated Place of the Moon, gives her Place Equated the fifth time, as before.

12. The Variation is best found, as shewn in Page 18. of my *Satellite Astronomy*.

But, however, you may do it thus: Subtract the Sun's Place from the fifth Equated Place of the Moon, and with the Distance enter the Table of Variation, and apply it to the 5th Equated Place of the Moon, gives the Place the 6th time Equated.

13. Lastly, Subtract the Sun's true place from the 6th Equated place of the Moon, and with that Remainder enter the Table of the seventh Equation, and take it out answering. Apply this Equation as the Table directs, to the Moon's sixth Equated place, and you have her true place in her Orbit.

14. To find the Moon's Latitude and Ecliptic place.]

With the Annual Argument of the Node (as found by the fifth Article hereof.) Enter the Table for computing the Moon's Latitude, and take out the Equation of the Node; which apply (according to its Title) to the first Equated place of the Node, gives its true place.

Also out of the same Table take the Logarithm-Sine of the Inclination of the Moon's Orb to the Ecliptic: For that is accommodated to the Greatest $5^{\circ} 17' 20''$ Sine 8.964625 in the Conjunction and Opposition; and also to the Least $4^{\circ} 59' 35''$ Sine 8.939693; Inclination in the Quadratures of the Nodes from the Sun; and then say,

As Radius

To the Sine of the Inclination,

So is the Sine of the Distance of the Moon from the nearest Node,

To the Sine of her present Latitude, which

is $\left\{ \begin{array}{l} \text{North Ascending} \quad \text{if Arg. } 50 \ 1 \ 2 \\ \text{North Descending} \quad \text{Lat. be } 3 \ 4 \ 5 \end{array} \right\}$ Signs

And $\left\{ \begin{array}{l} \text{South Ascending} \quad \text{if Arg. } 56 \ 7 \ 8 \\ \text{South Descending} \quad \text{Lat. be } 9 \ 10 \ 11 \end{array} \right\}$ Signs.

The Work for the first Example stands thus:

As Radius — — 90..0..10.000000

To the Sine of the Inclination;

So is the Sine $\triangleright$ from nearest Node,

To Sine Latitude.

15. The Table of Reduction is accommodated to the Mean Inclination of the Lunar Orbit; that is, when the Sun is in the Octants, or 45° Distant from the Moon's Nodes; so that entering with the Argument of Latitude, you may take out the Reduction answering, and apply it to the Orbit Place of the Moon, gives her Place reduced to the Ecliptic: But to have the Reduction perfectly true, it will be best to say,

As Radius,

To CS of the Inclination of the Lunar Orbit;

So Tangent of the Argument of Latitude,

To the Tangent of an Arch, which subtracted from the Arg. of Lat. leaves the Reduction, which apply to the mean Orbit Place, as above, gives her Ecliptic Place.

First Example of the SUN's Place.

Equal time	Long. ☉ S. ° ' "	Anom. ☉ S. ° ' "	An. Argum. S. ° ' "	This belongs to the Moon.
Anno 1731	9 20 27 32	6 12 11 51	1 27 20 5	1 ☉ 27 20 5
May	7 4 5 10 37 4	5 10 6 4 13 26 58		6 ☾ 27 54 2
Hours 10	24 38	24 38	9 13 53 7	6 29 26 3
Mean Mor.	1 26 3 7	10 17 46 35		10 24 49 34
Equat. add	1 16 58			5 25 15 27
		Log. 5.005462		Arg. 4. Equat.
☉'s tr. Place	1 27 20 5			

Second Example of the SUN's Place.

Equal time	Long. ☉ S. ° ' "	Anom. ☉ S. ° ' "	An. Argum. S. ° ' "	This belongs to the Moon.
Anno 1734	9 20 44 1	9 12 24 50	6 4 4 51	6 ☉ 4 4 51
Septemb. 16	8 15 16 57	8 15 16 13	8 29 39 32	6 ☾ 3 19 46
Mean Mor.	6 6 0 58	2 27 41 3	9 4 25 19	0 0 45 5
Equat. sub.	1 56 7			6 8 40 23
☉'s tr. Place	6 4 4 51	Log. 5.000420		6 9 25 28
				Arg. 4. Equat.

First Examination of the Moon's Motion

Equal time.	Long. S.	Apog. S.
173110	25 2 40	25 2 1
77	25 22 2	25 22 2
10	25 22 2	25 22 2
0	25 22 2	25 22 2
1	25 22 2	25 22 2
2	25 22 2	25 22 2
3	25 22 2	25 22 2
4	25 22 2	25 22 2
5	25 22 2	25 22 2
6	25 22 2	25 22 2
7	25 22 2	25 22 2
8	25 22 2	25 22 2
9	25 22 2	25 22 2
10	25 22 2	25 22 2
11	25 22 2	25 22 2
12	25 22 2	25 22 2
13	25 22 2	25 22 2
14	25 22 2	25 22 2
15	25 22 2	25 22 2
16	25 22 2	25 22 2
17	25 22 2	25 22 2
18	25 22 2	25 22 2
19	25 22 2	25 22 2
20	25 22 2	25 22 2
21	25 22 2	25 22 2
22	25 22 2	25 22 2
23	25 22 2	25 22 2
24	25 22 2	25 22 2
25	25 22 2	25 22 2
26	25 22 2	25 22 2
27	25 22 2	25 22 2
28	25 22 2	25 22 2
29	25 22 2	25 22 2
30	25 22 2	25 22 2

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First Example of the Moon's Place.

Equal time.		Long. D. "				Apog. D. "			
		S.	°	'	"	S.	°	'	"
Anno	1731	10	29	5	46	3	29	2	1
May	—	7	23	24	5	14	8	56	
Hours	10		5	29	25		2	47	
Mean Motion		6	27	59	18	4	13	13	44
1 Equation sub.				7	48		+	13	14
2 Equated		6	27	51	30	4	13	26	58
3 Equation add				1	45		6	58	22
Moon Equated		6	27	53	15	4	6	28	36
4 Equation add					47		L.Ec.8.653279		
Moon Equated		6	27	54	2		Db.17.306558		
5 Equation add					15		Tr.25.959837		
Moon Equated		6	27	54	17		2	34	37
Apogee sub.		4	6	28	36		45	0	0
Mean Anom.		2	21	25	41		42	25	23
Double		5	12	51	22		4	043	05
Complement		0	17	8	38		38	11	19
Equat. + to M. An.					30		76	22	38
Angle upper Focus		2	21	26	11		S. Incl. 5° 9' 4" 8.95321		
Half		1	10	43	5		S. D. 76° 31' 41" 9.98786		
True Anomaly		2	16	22	38		S. Lt. SD 5 0 33 8.94109		
Apogee add		2	10	28	36		For the Reduction.		
Moon Equated		6	22	51	14		As Rad. 90 0 0 10.000000		
Variation sub.				32	49		To C.S. Inc. 5 9 4 9.998242		
Moon Equated		6	22	18	25		Sor. A. Lat. 76 31 41 10.620584		
7 Equation sub.				1	20		Tot. — of 76.28 31 10.618826		
Moon in her Orb		6	22	17	5		Reduction 0 3 10 add		
Node sub.		9	8	48	46				
Arg. Latit.		9	13	28	19				
True Lat. S.D.			5	0	33		Ellipt. Equat. 5° 3' 3" sub.		
Reduction add				3	10				
Ecliptic Place		6	22	20	15				

URANOSCOPIA.

First Example of the Moon's Place.

Node ♄. "			
S.	°	'	"
9	17	9	33
	6	43	31
		1	19
—	6	44	50
9	10	24	43
—		6	17
9	10	18	26
1	27	20	5
4	17	1	39
—	1	29	40
9	8	48	46
Conf. Log. 72.933542			
0 1 " 17.306558			
17 8 38 9.469487			
.5124 + 99.709587			
43.359870			
25.959837			
81 25 41 29.985363			
002019 99.305070			
.514319			
860			
30.865140 +			
6 22 51 14			
1 27 20 5			
4 25 31 9			
Arg. 6 Equat.			
6 23 18 25			
1 27 20 5			
4 24 58 20			
Arg. 7 Equat.			

Second

URANOSCOPIA

Second Example of the Moon's Place.

Equal time.	Long. ☾ S. ° ' "	Apog. ☾ S. ° ' "
Anno 1724	0 10 25 33	3 1 8 13
September 16	5 22 41 10	0 28 51 17
Mean Motion	6 3 6 43	8 29 59 30
1 Equation	sub. 11 48	add 19 58
☾ equated	6 3 18 31	8 29 39 32
2 Equation	sub. 34	add 2 22 13
Moon equated	6 3 19 5	8 27 17 19
3 Equation	sub. 41	L. Ecc. 8.638505
Moon equated	6 3 19 46	Doub. 17.277010
4 Equation	— 23	Trip. 25.915515
Moon equated	6 3 19 23	☾ 42 30 32 9.962187
Apog. sub.	8 27 17 19	☾ 41 59 8 9.954217
Mean Anom.	9 6 2 4	☾ 39 31 9 9.916404
Double	6 12 4 8	180 0 0
Equ. sub. à M. A.	20	140 28 51
☾ upper Focus	9 6 1 44	280 57 43
Half —	4 18 0 52	True Anom
Complement	1 11 59 8	
True Anomaly	9 10 57 42	
Apogee add	8 27 17 19	S. Incl. 5° 12' 29" 8.95797
Moon equated	6 8 15 1	S. ☾ à 88 25 52 57 9.640011
Variation	sub. 5 6	S. Lt. S. D. 2 16 16 8.597981
Moon equated	6 8 20 7	
7 Equation	add 10	As Rad. 90 00 0 -10.000000
☾ in her Orb	6 8 19 57	To C. S. Inc. 5 12 29 9.998203
Node sub.	7 4 12 54	So t. A. Lt 25 52 57 9.685918
Arg. Lat.	11 4 7 3	To t. of 25 52 57 9.684121
True Lat. S. D.	2 16 16	Reduction 0 5 35
Reduction add	0 5 35	
Ecliptic Place	6 8 25 32	Ellip. Eq. 4 55 38 add

Second Example of the Moon's Place.

Node D					
S.	°	'	"		
7	19	7	13	Contt. Log	72.933542
	13	42	56		17.277010
7	5	24	17	12° 4' 8" —	9.320328
	add 9	29		1.3395 —	99.530880
7	8	5	33		43.359870
6	⊙	4	4		25.915515
10	28	31	5	83° 57' 56" —	29.993760
	12	29	28	.001859 —	99.269145
	45	00	00	.341359 Z —	
	42	30	32	60	
Equ. —	1	20	52	"20.481540 —	
7	8	4	12	6	8 15 1
				6	⊙ 4 4 51
				0	4 10 10
				6	8 20 7
				6	⊙ 8 4 51
				0	4 15 16

A Table of the first, or Annual Equation of the Moon.

Mean Anomaly of the Sun.

Anom. ☉	Sign 0						Sign 1						Anom. ☉
	Long. add		Apog. sub.		Nod. add		Long. add		Apog. sub.		Node add		
0	0	1	0	0	0	0	5	47	9	49	4	40	30
1	0	12	0	20	0	9	5	58	10	7	4	48	29
2	0	24	0	41	0	19	6	9	10	24	4	57	28
3	0	36	1	1	0	29	6	19	10	42	5	5	27
4	0	48	1	22	0	39	6	29	10	59	5	15	26
5	1	00	1	42	0	48	6	39	11	16	5	21	25
6	1	12	2	3	0	58	6	49	11	33	5	29	24
7	1	24	2	23	1	8	6	59	11	49	5	37	23
8	1	36	2	43	1	18	7	9	12	6	5	45	22
9	1	48	3	4	1	27	7	19	12	22	5	53	21
10	1	59	3	24	1	37	7	28	12	39	6	0	20
11	2	11	3	44	1	46	7	37	12	55	6	8	19
12	2	23	4	4	1	56	7	46	13	10	6	15	18
13	2	35	4	24	2	5	7	55	13	26	6	22	17
14	2	46	4	44	2	15	8	4	13	41	6	30	16
15	2	51	5	4	2	24	8	13	13	56	6	37	15
16	3	10	5	24	2	34	8	22	14	10	6	44	14
17	3	22	5	44	2	43	8	31	14	25	6	50	13
18	3	34	6	3	2	53	8	39	14	39	6	57	12
19	3	46	6	23	3	2	8	47	14	53	7	4	11
20	3	57	6	43	3	11	8	55	15	7	7	11	10
21	4	2	7	2	3	20	9	3	15	21	7	17	9
22	4	20	7	21	3	29	9	11	15	33	7	23	8
23	4	31	7	40	3	38	9	19	15	46	7	29	7
24	4	42	7	59	3	47	9	27	15	58	7	35	6
25	4	53	8	18	3	56	9	34	16	11	7	41	5
26	5	4	8	36	4	5	9	41	16	23	7	46	4
27	5	15	8	54	4	14	9	47	16	35	7	52	3
28	5	26	9	13	4	23	9	54	16	46	7	58	2
29	5	37	9	31	4	31	10	1	16	57	8	4	1
30	5	47	9	49	4	40	10	7	17	8	8	9	0

| sub. | add | sub. |
| sub. | add | sub. |

Sign 11
Sign 10

Moon.

A Table of the first, or Annual Equation of the Moon.

Mean Anomaly of the SUN.

Anom. ☉	Sign 2						Sign 3						Anom. ☉
	Long. add	Apog. sub.	Node add	Long. add	Apog. sub.	Node add	Long. add	Apog. sub.	Node add	Long. add	Apog. sub.	Node add	
30	0 20 7	17 8	8 9	11 49 20 0	9 30	30	11 49 20 0	9 30	30	11 49 20 0	9 30	30	30
29	1 10 14	17 19	8 14	11 49 20 0	9 30	29	11 49 20 0	9 30	29	11 49 20 0	9 30	29	29
28	2 10 20	17 29	8 19	11 49 20 0	9 30	28	11 49 20 0	9 30	28	11 49 20 0	9 30	28	28
27	3 10 26	17 39	8 24	11 48 19 59	9 30	27	11 48 19 59	9 30	27	11 48 19 59	9 30	27	27
26	4 10 31	17 48	8 28	11 48 19 58	9 29	26	11 48 19 58	9 29	26	11 48 19 58	9 29	26	26
25	5 10 37	17 38	8 32	11 47 19 57	9 29	25	11 47 19 57	9 29	25	11 47 19 57	9 29	25	25
24	6 10 42	18 7	8 36	11 47 19 56	9 28	24	11 47 19 56	9 28	24	11 47 19 56	9 28	24	24
23	7 10 47	18 16	8 40	11 45 19 54	9 27	23	11 45 19 54	9 27	23	11 45 19 54	9 27	23	23
22	8 10 52	18 24	8 44	11 44 19 51	9 26	22	11 44 19 51	9 26	22	11 44 19 51	9 26	22	22
21	9 10 56	18 52	8 48	11 42 19 49	9 25	21	11 42 19 49	9 25	21	11 42 19 49	9 25	21	21
20	10 11 1	18 39	8 52	11 41 19 46	9 24	20	11 41 19 46	9 24	20	11 41 19 46	9 24	20	20
19	11 11 5	18 46	8 55	11 39 19 42	9 22	19	11 39 19 42	9 22	19	11 39 19 42	9 22	19	19
18	12 11 9	18 53	8 58	11 36 19 38	9 20	18	11 36 19 38	9 20	18	11 36 19 38	9 20	18	18
17	13 11 14	19 0	9 2	11 34 19 34	9 18	17	11 34 19 34	9 18	17	11 34 19 34	9 18	17	17
16	14 11 19	19 6	9 5	11 31 19 30	9 16	16	11 31 19 30	9 16	16	11 31 19 30	9 16	16	16
15	15 11 22	19 12	9 7	11 29 19 25	9 14	15	11 29 19 25	9 14	15	11 29 19 25	9 14	15	15
14	16 11 25	19 18	9 10	11 25 19 20	9 12	14	11 25 19 20	9 12	14	11 25 19 20	9 12	14	14
13	17 11 28	19 23	9 12	11 22 19 14	9 9	13	11 22 19 14	9 9	13	11 22 19 14	9 9	13	13
12	18 11 30	19 28	9 15	11 19 19 8	9 6	12	11 19 19 8	9 6	12	11 19 19 8	9 6	12	12
11	19 11 32	19 33	9 17	11 15 19 2	9 3	11	11 15 19 2	9 3	11	11 15 19 2	9 3	11	11
10	20 11 35	19 37	9 19	11 11 18 55	8 59	10	11 11 18 55	8 59	10	11 11 18 55	8 59	10	10
9	21 11 38	19 41	9 21	11 6 18 48	8 56	9	11 6 18 48	8 56	9	11 6 18 48	8 56	9	9
8	22 11 40	19 44	9 22	11 2 18 41	8 52	8	11 2 18 41	8 52	8	11 2 18 41	8 52	8	8
7	23 11 42	19 48	9 24	10 58 18 33	8 49	7	10 58 18 33	8 49	7	10 58 18 33	8 49	7	7
6	24 11 43	19 51	9 25	10 53 18 25	8 45	6	10 53 18 25	8 45	6	10 53 18 25	8 45	6	6
5	25 11 45	19 53	9 26	10 48 18 17	8 41	5	10 48 18 17	8 41	5	10 48 18 17	8 41	5	5
4	26 11 46	19 55	9 27	10 45 18 8	8 37	4	10 45 18 8	8 37	4	10 45 18 8	8 37	4	4
3	27 11 47	19 57	9 28	10 38 17 59	8 33	3	10 38 17 59	8 33	3	10 38 17 59	8 33	3	3
2	28 11 48	19 58	9 29	10 32 17 50	8 28	2	10 32 17 50	8 28	2	10 32 17 50	8 28	2	2
1	29 11 48	19 59	9 29	10 36 17 40	8 23	1	10 36 17 40	8 23	1	10 36 17 40	8 23	1	1
0	30 11 49	20 0	9 30	10 21 17 30	8 19	0	10 21 17 30	8 19	0	10 21 17 30	8 19	0	0
	sub.	add	sub.	sub.	add	sub.	sub.	add	sub.	sub.	add	sub.	
	Sign 8						Sign 7						

A Table of the first, or Annual Equation of the Moon

Mean Anomoly of the SUN,

Anom. $\odot$	Sign. 4.			Sign 5.			Anom. $\odot$
	Long.	Apog.	Node	Long.	Apog.	Node	
	D add ' "	sub. ' "	add ' "	D add ' "	sub. ' "	add ' "	
0	10 21	17 30	8 19	6 0	10 11	4 50	30
1	10 15	17 20	8 14	5 49	9 52	4 41	29
2	10 7	17 02	8 19	5 38	9 33	4 32	28
3	10 1	16 58	8 14	5 27	9 15	4 23	27
4	9 55	16 46	7 58	5 16	8 56	4 14	26
5	9 47	16 34	7 53	5 5	8 34	4 5	25
6	9 40	16 23	7 48	4 53	8 17	3 56	24
7	9 33	16 11	7 42	4 42	7 58	3 47	23
8	9 26	15 58	7 35	4 30	7 38	3 38	22
9	9 19	15 45	7 29	4 18	7 18	3 29	21
10	9 11	15 32	7 23	4 6	6 58	3 19	20
11	9 2	15 18	7 16	3 54	6 38	3 9	19
12	8 54	15 4	7 19	3 43	6 18	2 59	18
13	8 46	14 50	7 13	3 31	5 58	2 50	17
14	8 37	14 36	6 16	3 19	5 38	2 40	16
15	8 28	14 21	6 49	3 7	5 17	2 30	15
16	8 20	14 16	6 42	2 54	4 56	2 20	14
17	8 11	13 51	6 35	2 42	4 35	2 10	13
18	8 0	13 35	6 27	2 30	4 14	2 0	12
19	7 52	13 20	6 20	2 18	3 54	1 50	11
20	7 43	13 4	6 12	2 5	3 33	1 40	10
21	7 34	12 48	6 14	1 52	3 12	1 30	9
22	7 24	12 31	5 56	1 40	2 51	1 20	8
23	7 14	12 15	5 49	1 28	2 30	1 10	7
24	7 8	11 58	5 41	1 15	2 8	1 0	6
25	6 53	11 41	5 33	1 2	1 46	0 50	5
26	6 43	11 23	5 24	0 49	1 25	0 40	4
27	6 35	11 5	5 16	0 37	1 4	0 30	3
28	6 22	10 47	5 08	0 25	0 43	0 20	2
29	6 11	10 29	4 59	0 12	0 21	0 10	1
30	6 0	10 11	4 50	0 0	0 0	0 0	0
	sub.	add	sub.	sub.	add.	sub.	
	Sign 7.			Sign 6.			

A Table of the Second Equation of the Moon.

Ann. Arg. =	Annual Argument.						Ann. Arg. =
	Sign 0 6	1 7	2 8	sub.	sub.	sub.	
0	0	0	3	15	3	15	30
1	0	8	3	19	3	11	29
2	0	16	3	22	3	6	28
3	0	23	3	25	3	2	27
4	0	31	3	28	2	57	26
5	0	39	3	31	2	52	25
6	0	47	3	34	2	47	24
7	0	54	3	36	2	41	23
8	1	2	3	38	2	36	22
9	1	9	3	40	2	30	21
10	1	17	3	42	2	24	20
11	1	24	3	43	2	18	19
12	1	31	3	44	2	12	18
13	1	38	3	44	2	5	17
14	1	46	8	45	1	59	16
15	1	52	3	45	1	52	15
16	1	59	3	45	1	46	14
17	2	5	3	44	1	38	13
18	2	12	3	44	1	31	12
19	2	18	3	43	1	24	11
20	2	24	3	42	1	17	10
21	2	30	3	40	1	9	9
22	2	36	3	38	1	2	8
23	2	41	3	36	0	54	7
14	2	47	3	34	0	47	6
25	2	52	3	31	0	39	5
26	2	57	3	28	0	31	4
27	3	2	3	25	0	24	3
28	3	6	3	22	0	16	2
29	3	11	3	19	0	8	1
30	3	15	3	15	0	0	0
	Si. 11. 5	Si. 10. 4	9	3			
	add	add	add				

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A Table of the third Equation of the Moon.

Ann. Arg.	Dist. of Sun from Node.						Ann. Arg.
	Sign 0 6		1 7		2 8		
	sub.		Sub.		Sub.		
0	01	0	01	41	0	41	30
1	01	1	01	41	0	40	29
2	0	3	0	42	0	39	28
3	0	5	0	42	0	38	27
4	0	6	0	42	0	37	26
5	0	8	0	44	0	36	25
6	0	10	0	45	0	35	24
7	0	11	0	45	0	34	23
8	0	13	0	45	0	32	22
9	0	14	0	46	0	31	21
10	0	16	0	46	0	30	20
11	0	17	0	46	0	29	19
12	0	19	0	47	0	27	18
13	0	20	0	47	0	26	17
14	0	22	0	47	0	25	16
15	0	23	0	47	0	23	15
16	0	25	0	47	0	22	14
17	0	26	0	47	0	20	13
18	0	27	0	47	0	19	12
19	0	29	0	46	0	17	11
20	0	30	0	46	0	16	10
21	0	31	0	49	0	14	9
22	0	32	0	45	0	13	8
23	0	34	0	45	0	11	7
24	0	36	0	44	0	10	6
25	0	36	0	44	0	8	5
26	0	37	0	43	0	6	4
27	0	38	0	43	0	5	3
28	0	39	0	42	0	3	2
29	0	40	0	41	0	1	1
30	0	41	0	41	0	0	0
	11	5	10	4	9	3	
	Add.		Add.		Add.		

A Table of the Fourth Equation of the Moon.

Ann. Arg. $\frac{1}{2}$	Argument 4th Equation.						Ann. Arg. $\frac{1}{2}$
	Si. $\left\{ \begin{smallmatrix} 0 \\ 6 \end{smallmatrix} \right\}$		Si. $\left\{ \begin{smallmatrix} 1 \\ 7 \end{smallmatrix} \right\}$		Si. $\left\{ \begin{smallmatrix} 2 \\ 8 \end{smallmatrix} \right\}$		
	I	II	I	II	I	II	
0	0	0	1	12	2	5	30
1	0	2	1	13	2	7	29
2	0	5	1	17	2	8	28
3	0	7	1	19	2	9	27
4	0	10	1	21	2	10	26
5	0	12	1	23	2	11	25
6	0	15	1	25	2	12	24
7	0	17	1	27	2	13	23
8	0	20	1	29	2	14	22
9	0	22	1	31	2	15	21
10	0	25	1	33	2	16	20
11	0	27	1	35	2	17	19
12	0	30	1	37	2	17	18
13	0	32	1	39	2	18	17
14	0	35	1	41	2	19	16
15	0	37	1	43	2	20	15
16	0	40	1	44	2	20	14
17	0	42	1	46	2	21	13
18	0	44	1	48	2	21	12
19	0	46	1	49	2	22	11
20	0	49	1	51	2	22	10
21	0	51	1	52	2	23	9
22	0	54	1	54	2	23	8
23	0	56	1	55	2	24	7
24	0	59	1	57	2	24	6
25	1	1	1	58	2	24	5
26	1	3	2	0	2	24	4
27	1	9	2	1	2	25	3
28	1	8	2	3	2	25	2
29	1	10	2	4	2	25	1
30	1	12	2	5	2	25	0
11 lub.		10 lub.		9 lub.			
5 Add		4 add.		3 add.			

A Table of the Second Equation of the Moon's Apogee, with the Logarithm of the Eccentricity of her Orb.

An. Arg.	Signs			Equation add.	Logarithm.	An. Arg.
	0 6.					
0	0	00	00	8.824629	30	
1	0	21	04	8.824590	29	
2	0	42	08	8.824475	28	
3	1	03	10	8.824284	27	
4	1	24	09	8.824016	26	
5	1	45	05	8.823671	25	
6	2	05	57	8.823252	24	
7	2	26	44	8.822753	23	
8	2	47	25	8.822179	22	
9	3	08	00	8.821529	21	
10	3	28	27	8.820803	20	
11	3	48	46	8.820001	19	
12	4	08	55	8.819124	18	
13	4	28	54	8.818170	17	
14	4	48	42	8.817142	16	
15	5	08	19	8.816038	15	
16	5	27	43	8.814858	14	
17	5	46	53	8.813604	13	
18	6	05	48	8.812275	12	
19	6	24	27	8.810873	11	
20	6	42	50	8.809397	10	
21	7	00	56	8.807847	9	
22	7	18	44	8.806223	8	
23	7	36	12	8.804528	7	
24	7	53	20	8.802760	6	
25	8	10	06	8.800920	5	
26	8	26	29	8.799009	4	
27	8	42	29	8.797028	3	
28	8	58	05	8.794978	2	
29	9	13	16	8.792857	1	
30	9	27	57	8.790668	0	
Signs			11	5 sub.		

The Table of the Second Equation of the Moon's Apogee, with the Logarithm of the Eccentricity of her Orb, continued.

An. Arg.	Signs		1	7	An. Arg.
	Equation add.			Logar.	
0	9	27	57	8.790668	30
1	9	42	12	8.788412	29
2	9	55	58	8.786089	28
3	10	09	14	8.783371	27
4	10	21	58	8.781248	26
5	10	34	09	8.778732	25
6	10	45	47	8.776153	24
7	10	56	49	8.773513	23
8	11	07	15	8.770814	22
9	11	17	04	8.768057	21
10	11	26	14	8.765243	20
11	11	34	43	8.762375	19
12	11	42	31	8.759454	18
13	11	49	36	8.756482	17
14	11	55	57	8.753461	16
15	12	01	33	8.750395	15
16	12	06	22	8.747248	14
17	12	10	23	8.744131	13
18	12	13	35	8.740941	12
19	12	15	56	8.737714	11
20	12	17	24	8.734455	10
21	12	17	59	8.731167	9
22	12	17	40	8.727853	8
23	12	16	25	8.724518	7
24	12	14	13	8.721164	6
25	12	11	02	8.717796	5
26	12	06	52	8.714419	4
27	12	01	42	8.711037	3
28	11	55	51	8.707654	2
29	11	48	17	8.704277	1
30	11	40	00	8.700910	0
Sign 10				4 sub.	

A Table of the Second Equation of the Moon's Apogee, with the Logarithm of the Eccentricity of her Orb.

An. Arg.	Signs			Logarithh.	Ann. Arg.
	Equation add.				
	0	1	2		
0	11	40	00	8.700910	30
1	11	30	39	8.697559	29
2	11	20	14	8.694229	28
3	11	9	44	8.690927	27
4	10	56	8	8.687658	26
5	10	42	26	8.684430	25
6	10	27	38	8.681247	24
7	10	11	45	8.678118	23
8	9	54	47	8.675051	22
9	9	36	44	8.672049	21
10	9	17	37	8.669121	20
11	8	57	25	8.666277	19
12	8	36	11	8.663520	18
13	8	13	56	8.660861	17
14	7	50	42	8.658305	16
15	7	26	29	8.655859	15
16	7	1	21	8.653532	14
17	6	35	19	8.651331	13
18	6	08	26	8.649261	12
19	5	40	45	8.647329	11
20	5	12	18	8.645542	10
21	4	43	10	8.643906	9
22	4	13	23	8.642426	8
23	3	43	01	8.641108	7
24	3	12	09	8.639954	6
25	2	40	49	8.638973	5
26	2	09	07	8.638164	4
27	1	37	06	8.637532	3
28	1	04	52	8.637079	2
29	0	32	28	8.636806	1
30	0	00	00	8.636715	0
Signs			9	3 sub.	

A Table of the Moon's Variation.

	0 Sign 6 add.	1 Sign 7 add.	2 Sign 8 add.	
☾	"	"	"	☾
☉				☉
0	00	30	27	30
1	14	31	03	29
2	27	31	36	28
3	40	32	07	27
4	54	32	36	26
5	06	33	03	25
6	19	33	27	24
7	30	33	48	23
8	41	34	07	22
9	52	34	24	21
10	02	34	38	20
11	10	34	50	19
12	18	34	59	18
13	25	35	05	17
14	30	35	09	16
15	35	35	10	15
16	38	35	09	14
17	40	35	05	13
18	40	34	54	12
19	39	34	50	11
20	36	34	38	10
21	32	34	24	9
22	26	34	07	8
23	18	33	48	7
24	08	33	27	6
25	56	33	03	5
26	43	32	26	4
27	27	32	07	3
28	09	31	36	2
29	49	31	03	1
30	27	30	27	0
	11 sub. 5	10 sub. 4	9 sub. 3	

A Table of the Seventh Equation of the Moon.

☾ v ☉	Sub. Add.	0 6 "	Sub. Add.	1 7 "	Sub. Add.	2 8 "	☾ v ☉
0	0	00	1	10	2	01	30
1	0	03	1	12	2	04	29
2	0	05	1	14	2	05	28
3	0	07	1	16	2	06	27
4	0	10	1	18	2	07	26
5	0	12	1	20	2	08	25
6	0	15	1	22	2	09	24
7	0	17	1	24	2	10	23
8	0	19	1	26	2	11	22
9	0	22	1	28	2	12	21
10	0	24	1	30	2	12	20
11	0	27	1	32	2	13	19
12	0	29	1	34	2	14	18
13	0	32	1	36	2	14	17
14	0	34	1	38	2	15	16
15	0	36	1	39	2	15	15
16	0	39	1	41	2	16	14
17	0	41	1	43	2	16	13
18	0	44	1	44	2	17	12
19	0	46	1	46	2	17	11
20	0	48	1	47	2	18	10
21	0	51	1	49	2	18	9
22	0	53	1	50	2	19	8
23	0	55	1	52	2	19	7
24	0	57	1	53	2	19	6
25	0	59	1	55	2	20	5
26	1	02	1	56	2	20	4
27	1	04	1	57	2	20	3
28	1	06	1	59	2	20	2
29	1	08	2	00	2	20	1
30	1	10	2	01	2	20	0
	Sub. Add.	5 11	Sub. Add.	4 10	Sub. Add.	3 9	

A Table of the Second Equation of the Moon's Node, with the Logarithm Sine of the Inclination of her Orbit.

Mean Distance of the Sun from the Node

Signs	0		6		Signs
	Equation		Logar.		
	add	"	Sine	"	
0	00	00	8.964625		30
1	03	13	8.96461		29
2	06	26	8.96459		28
3	09	38	8.96456		27
4	12	49	8.96451		26
5	16	00	8.96444		25
6	19	09	8.96436		24
7	22	16	8.96426		23
8	25	22	8.96415		22
9	28	26	8.96403		21
10	31	28	8.96390		20
11	34	27	8.96375		19
12	37	24	8.96358		18
13	40	17	8.96340		17
14	43	07	8.96321		16
15	45	54	8.96300		15
16	48	38	8.96278		14
17	51	17	8.96255		13
18	53	53	8.96231		12
19	56	24	8.96205		11
20	58	51	8.96178		10
21	01	14	8.96150		9
22	03	32	8.96121		8
23	05	44	8.96091		7
24	07	52	8.96060		6
25	09	55	8.96028		5
26	11	53	8.95995		4
27	13	43	8.95960		3
28	15	29	8.95925		2
29	17	13	8.95889		1
30	18	44	8.95853		0
Signs +1.			5 sub.		

A Table of the Second Equation of the Moon's Node, with the Logarithm-Sine of the Inclination of her Orbit.

Mean Distance of the Sun from the Node

Signs	Equation	Logar.	Sine
	add	"	"
0	18	44	8.95853
1	20	12	8.95816
2	21	35	8.95777
3	22	51	8.95737
4	24	01	8.95698
5	25	04	8.95658
6	26	01	8.95617
7	26	32	8.95576
8	27	37	8.95534
9	28	14	8.95492
10	28	46	8.95450
11	29	10	8.95407
12	29	28	8.95363
13	29	40	8.95320
14	29	45	8.95277
15	29	43	8.95234
16	29	35	8.95190
17	29	21	8.95147
18	28	39	8.95104
19	28	32	8.95060
20	27	38	8.95017
21	27	17	8.94974
22	26	31	8.94931
23	25	38	8.94889
24	24	39	8.94847
25	23	34	8.94806
26	22	23	8.94764
27	21	06	8.94724
28	19	44	8.94684
29	18	16	8.94643
30	16	02	8.94603
Signs 10		4 sub.	

A Table of the Second Equation of the Moon's Node, with the Logarithm-Sine of the Inclination of her Orbit.

Mean Distance of the Sun from the Node.

☉	Signs			3	8	☉
☉	Equation add.				Logar. Sine.	☉
☉						☉
0	1	16	42	8.94605	30	
1	1	15	02	8.94567	29	
2	1	13	19	8.94531	28	
3	1	11	30	8.94495	27	
4	1	9	35	8.94459	26	
5	1	7	36	8.94423	25	
6	1	5	32	8.94391	24	
7	1	3	24	8.94359	23	
8	1	1	11	8.94328	22	
9	0	58	54	8.94298	21	
10	0	56	33	8.94269	20	
11	0	54	08	8.94241	19	
12	0	51	39	8.94214	18	
13	0	49	07	8.94188	17	
14	0	46	31	8.94164	16	
15	0	43	53	8.94141	15	
16	0	41	11	8.94119	14	
17	0	38	26	8.94099	13	
18	0	35	39	8.94080	12	
19	0	32	49	8.94062	11	
20	0	29	57	8.94046	10	
21	0	27	04	8.94032	9	
22	0	24	08	8.94019	8	
23	0	21	10	8.94008	7	
24	0	18	12	8.93997	6	
25	0	15	12	8.93988	5	
26	0	12	10	8.93981	4	
27	0	9	09	8.93976	3	
28	0	6	06	8.93972	2	
29	0	2	03	8.93970	1	
30	0	0	00	8.93970	0	
Sign 9			3 sub.			

Middle Distance of Sun from the Moon's Node.

Arg. Lat.	Sign 0 N. Sign 6 S. Latitude.	Inclinat. of the Way of the Moon in Eclipses.	Reduc. Sub.	Arg. Lat.
	'	"	"	"
0	00	00	5 17 20	0 0 30
1	05	14	5 17 17	0 14 29
2	10	28	5 17 08	0 29 28
3	15	42	5 16 54	0 43 27
4	20	56	5 16 33	0 58 26
5	26	09	5 16 07	1 12 25
6	31	21	5 15 35	1 26 24
7	36	33	5 14 56	1 41 23
8	41	45	5 14 13	1 55 22
9	46	52	5 13 23	2 9 21
10	52	05	5 12 28	2 22 20
11	57	14	5 11 27	2 36 19
12	02	22	5 10 20	2 49 18
13	07	28	5 09 07	3 2 17
14	12	34	5 07 49	3 15 16
15	17	38	5 06 25	3 28 15
16	22	41	5 04 55	3 40 14
17	27	42	5 03 20	3 53 13
18	32	42	5 01 39	4 4 12
19	37	40	4 59 53	4 16 11
20	42	36	4 58 00	4 27 10
21	47	31	4 56 03	4 38 9
22	52	24	4 54 00	4 49 8
23	57	15	4 51 51	4 59 7
24	02	03	4 49 37	5 9 6
25	06	48	4 47 18	5 19 5
26	11	33	4 44 54	5 28 4
27	16	14	4 42 24	5 37 3
28	20	52	4 39 49	5 45 2
29	35	29	4 37 09	5 53 1
30	30	03	4 34 24	6 0 0

Sign 11 South
} Descend.
Add

Sign 5 North
} Ascend.
Sub.

A Table of the Latitude of the Moon, &c. in the Syzygias.

Middle Distance of the Sun from the Moon's Node.

Arg. Lat. =	Sign 1 North Sign 7 South Latitude.	Reduc. Sub.	Arg. Lat. =
0	0	0	30
14	2 30 03	6 00	29
29	2 34 33	6 07	28
43	2 39 01	6 14	27
58	2 43 26	6 20	26
12	2 47 39	6 26	25
26	2 52 08	6 31	24
41	2 56 24	6 36	23
55	3 00 37	6 40	22
9	3 04 46	6 44	21
22	3 08 52	6 47	20
36	3 12 54	6 50	19
49	3 16 53	6 52	18
2	3 20 48	6 54	17
15	3 24 40	6 55	16
28	3 28 28	6 56	15
40	3 32 12	6 56	14
53	3 35 52	6 56	13
4	3 39 28	6 55	12
16	3 43 0	6 54	11
27	3 46 27	6 52	10
38	3 49 52	6 50	9
49	3 53 11	6 47	8
59	3 56 25	6 44	7
9	3 59 37	6 40	6
19	4 02 42	6 36	5
28	4 05 45	6 31	4
37	4 08 42	6 26	3
45	4 11 34	6 20	2
53	4 14 22	6 14	1
0	4 17 07	6 07	0
dd	4 19 44	6 00	0
	Sign 10 South } Sign 4 North } Descend. add		

A Table of the Latitude of the Moon, &c. in the Syzygia.

Middle Distance of Sun from the Moon's Node.

Arg. Lat.	Sign 2 N. Sign 8 S. Latitude.		Reduc. sub.		Arg. Lat.
0	4	19	44	6	00
1	4	22	17	5	53
2	4	24	47	5	45
3	4	27	11	5	37
4	4	29	30	3	28
5	4	31	45	5	19
6	4	33	54	5	09
7	4	35	59	4	59
8	4	37	57	4	49
9	4	39	52	4	38
10	4	41	41	4	27
11	4	43	25	4	16
12	4	45	04	4	04
13	4	46	58	3	53
14	4	48	09	3	40
15	4	49	29	3	28
16	4	50	47	3	15
17	4	52	00	3	02
18	4	53	07	2	49
19	4	54	08	2	36
20	4	55	03	2	22
21	4	55	56	2	09
22	4	56	48	1	55
23	4	57	22	1	41
24	4	57	58	1	26
25	4	58	27	1	12
26	4	58	51	0	58
27	4	59	10	0	43
28	4	59	24	0	29
29	4	59	34	0	14
30	4	59	35	0	00
Sign 10 South			Defc. add.		
Sign 4 North			5		

Table of the Hourly Motions, Semidiameters, and Horizontal Parallels of the Sun and Moon in Eclipses.

Mean A-nom. ☉ and ♀ S.		Hourly Motion of the ☉		Semidi-meter of the Sun.		Mean A-nom. ☉ and ♀ S.	
°	'	1	2	1	2	°	'
0	0	2	23	15	49	0	12
	5	2	23	15	49	25	
	10	2	23	15	49	20	
	15	2	23	15	49	15	
	20	2	23	15	50	10	
	25	2	23	15	50	5	
1	0	2	24	15	51	0	11
	5	2	24	15	51	25	
	10	2	24	15	52	20	
	15	2	24	15	53	15	
	20	2	25	15	54	10	
	25	2	25	15	55	5	
2	0	2	25	15	56	0	10
	5	2	26	15	57	25	
	10	2	26	15	59	20	
	15	2	26	16	01	15	
	20	2	27	16	02	10	
	25	2	27	16	03	5	
3	0	2	28	16	05	0	9
	5	2	28	16	06	25	
	10	2	28	16	07	20	
	15	2	29	16	09	15	
	20	2	29	16	10	10	
	25	2	30	16	11	5	
4	0	2	30	16	13	0	8
	5	2	31	16	14	25	
	10	2	31	16	15	20	
	15	2	31	16	16	15	
	20	2	32	16	17	10	
	25	2	32	16	18	5	
5	0	2	32	16	19	0	7
	5	2	32	16	20	25	
	10	2	33	16	20	20	
	15	2	33	16	21	15	
	20	2	33	16	21	10	
	25	2	33	16	22	5	
6	0	2	33	16	22	0	6

A Table of the Hourly Motions, Semidiameters, and Horizontal Parallaxes of the Sun and Moon in Eclipses.

Mean A- nom. ☉ and ☽. S. °		Tr. Hour- ly Motion of the ☽. " "		Semidi- ameter of the Moon " "		Horiz. Parallax of ☽. " "		Mean A- nom. ☉ and ☽. S. °	
0	0	29	33	14	42	53	28	0	12
	5	29	34	14	42	53	29	25	
	10	29	36	14	43	53	31	20	
	15	29	39	14	44	53	35	15	
	20	29	45	14	45	53	41	10	
	25	29	53	14	47	73	48	5	
1	0	30	01	14	50	53	57	0	11
	5	30	11	14	53	54	07	25	
	10	30	22	14	55	54	18	20	
	15	30	36	14	59	54	32	15	
	20	30	50	15	02	54	45	10	
	25	31	06	15	07	55	06	5	
2	0	31	23	15	11	55	16	0	10
	5	31	42	15	16	55	33	25	
	10	32	01	15	21	55	51	20	
	15	32	23	15	26	56	10	15	
	20	32	45	15	31	56	30	10	
	25	33	08	15	37	56	49	5	
3	0	33	32	15	42	57	09	0	9
	5	33	56	15	48	57	29	25	
	10	34	21	15	53	58	49	20	
	15	34	45	15	59	58	09	15	
	20	35	08	16	04	58	28	10	
	25	35	31	16	10	59	47	5	
4	0	35	54	16	15	59	05	0	8
	5	36	14	16	19	59	23	25	
	10	36	34	16	24	59	40	20	
	15	36	53	16	28	59	55	15	
	20	37	10	16	32	60	10	10	
	25	37	24	16	36	60	23	5	
5	0	37	39	16	39	60	34	0	7
	5	37	50	16	42	60	44	25	
	10	38	00	16	44	60	52	20	
	15	38	06	16	45	60	58	15	
	20	38	14	16	47	61	03	10	
	25	38	17	16	48	61	06	5	
6	0	38	18	16	48	61	07	0	6

A Table of the Moon's Ecliptic Equation and Logarithm of her Distance from the Earth, to supply the Place of that in my System, Pages 51, 52, 53.

Anom.	Sign o sub.			Anom.
	Equation.		Logar.	
0	0	00	00	30
1	0	05	00	29
2	0	09	58	28
3	0	14	56	27
4	0	19	54	25
5	0	24	54	23
6	0	29	52	24
7	0	34	48	23
8	0	39	46	22
9	0	44	44	21
10	0	49	36	20
11	0	54	52	19
12	0	59	22	18
13	1	04	14	17
14	1	09	10	16
15	1	14	00	15
16	1	18	48	14
17	1	23	38	13
18	1	28	24	12
19	1	33	10	11
20	1	37	54	10
21	1	42	32	9
22	1	47	16	8
23	1	51	54	7
24	1	56	32	6
25	2	01	08	5
26	2	05	40	4
27	2	10	12	3
28	2	14	40	2
29	2	19	08	1
30	2	23	32	0
Sign 11			add	

The Table of the Moon's Ecliptic Equation and Logarithm
continued.

Anom.	Sign		i	sub.	Equation.		Logar.	Anom.
0	2	23	32			5.026200	30	
1	2	27	54			5.025968	29	
2	2	32	14			5.025728	28	
3	2	36	32			5.035482	27	
4	2	40	44			5.025228	26	
5	2	45	00			5.024967	25	
6	2	49	08			5.024699	24	
7	2	53	14			5.024424	23	
8	2	57	16			5.024142	22	
9	3	1	18			5.023853	21	
10	3	5	18			5.023557	20	
11	3	9	10			5.023254	19	
12	3	13	02			5.022944	18	
13	3	16	52			5.022628	17	
14	3	20	36			5.022304	16	
15	3	24	18			5.021974	15	
16	3	27	56			5.021638	14	
17	3	31	32			5.021294	13	
18	3	35	02			5.020945	12	
19	3	38	32			5.020590	11	
20	3	41	54			5.020228	10	
21	3	45	16			5.019860	9	
22	3	48	31			5.019485	8	
23	3	51	46			5.019105	7	
24	3	54	54			5.018718	6	
25	4	58	00			5.018326	5	
26	3	1	00			5.017928	4	
27	4	3	58			5.017523	3	
28	4	6	50			5.017113	2	
29	4	9	38			5.016698	1	
30	4	12	20			5.016277	0	
Sign				10	add			

A Table of the Moon's Elliptic Equation and Logarithm of her Distance from the Earth, continued.

Anom.	Sign 2 sub.			Anom.	
	Equation.		Logar.		
0	4	12	20	5.016277	30
1	4	15	04	5.015851	29
2	4	17	36	5.015419	28
3	4	20	10	5.014982	27
4	4	23	36	5.014540	26
5	4	24	58	5.014093	25
6	4	27	14	5.013640	24
7	4	29	30	5.013183	23
8	4	31	36	5.012722	22
9	4	33	42	5.012255	21
10	4	35	38	5.011784	20
11	4	37	34	5.011309	19
12	4	39	22	5.010838	18
13	4	41	08	5.010346	17
14	4	42	46	5.009858	16
15	4	44	20	5.009367	15
16	4	45	50	5.008871	14
17	4	47	16	5.008371	13
18	4	48	34	5.007869	12
19	4	49	50	5.007363	11
20	4	50	58	5.006853	10
21	4	52	04	5.006341	9
22	4	53	00	5.005826	8
23	4	53	56	5.005307	7
24	4	54	42	5.004786	6
25	4	55	26	5.004262	5
26	4	56	02	5.003736	4
27	4	56	36	5.093207	3
28	4	57	02	5.002677	2
29	4	57	34	5.002144	1
30	4	57	40	5.001610	0
Sign 9 add					

The Table of the Moon's Elliptic Equation, with the Logarithm of her Distance from the Earth, continued.

Anom. =	Signs 3 sub.			Logarithrh.	Anom. =
	Equation.				
	o	'	"		
0	4	57	40	5.001610	30
1	4	57	52	5.001074	29
2	4	57	54	5.000537	28
3	4	57	56	4.999998	27
4	4	57	50	4.999458	26
5	4	57	42	4.998917	25
6	4	57	24	4.998375	24
7	4	57	02	4.997832	23
8	4	56	34	4.997290	22
9	4	56	02	4.996747	21
10	4	55	22	4.996203	20
11	4	54	40	4.995659	19
12	4	53	48	4.995117	18
13	4	52	54	4.993575	17
14	4	51	52	4.994033	16
15	4	50	48	4.993492	15
16	4	49	36	4.992952	14
17	4	48	20	4.992412	13
18	4	46	56	4.991874	12
19	4	45	30	4.991337	11
20	4	43	56	4.990803	10
21	4	42	18	4.990270	9
22	4	40	34	4.989739	8
23	4	38	46	4.989211	7
24	4	36	48	4.988685	6
25	4	34	56	4.988162	5
26	4	32	44	4.987641	4
27	4	30	36	4.987124	3
28	4	28	18	4.986610	2
29	4	25	58	4.986099	1
30	4	23	30	4.985591	0
Signs 8				add.	

Table of the Moon's Elliptic Equation, with the Logarithm of her Distance from the Earth, continued.

Anom. //	Sign		4	sub.	Anom. //
	Equation.		"	Logar.	
	o	1			
0	4	23	30	4.955591	30
1	4	21	02	4.985088	29
2	4	18	24	4.984588	28
3	4	15	44	4.984093	27
4	4	12	56	4.983602	26
5	4	10	08	4.983116	25
6	4	07	10	4.982634	24
7	4	04	10	4.982158	23
8	4	01	02	4.981686	22
9	3	57	54	4.981220	21
10	3	54	36	4.980759	20
11	3	51	18	4.980304	19
12	3	47	52	4.979856	18
13	3	44	24	4.979412	17
14	3	40	50	4.978975	16
15	3	37	14	4.978545	15
16	3	33	28	4.978120	14
17	3	29	44	4.977703	13
18	3	25	52	4.977293	12
19	3	21	58	4.976890	11
20	3	17	58	4.976494	10
21	3	13	56	4.976106	9
22	3	09	48	4.975724	8
23	3	05	38	4.975351	7
24	3	01	24	4.974929	6
25	2	57	06	4.974629	5
26	2	52	44	4.974280	4
25	2	48	18	4.973939	3
28	2	43	50	4.973607	2
29	2	39	17	4.973284	1
30	2	34	42	4.972970	0
Sign		7	add.		

The Table of the Moon's Elliptic Equation, with the Logarithm of her Distance from the Earth, continued.

Anom.	Sign 5			sub.	Anom.
	Equation			Logar.	
0	2	34	42	4.972970	30
1	2	30	06	4.972665	29
2	2	25	22	4.972368	28
3	2	20	38	4.972081	27
4	2	15	50	4.971802	26
5	2	11	02	4.971534	25
6	2	06	08	4.971274	24
7	2	01	14	4.971025	23
8	1	56	14	4.970785	22
9	1	51	14	4.970555	21
10	1	46	12	4.970335	20
11	1	41	08	4.970126	19
12	1	36	00	4.969927	18
13	1	30	52	4.969738	17
14	1	25	40	4.969559	16
15	1	20	28	4.969391	15
16	1	15	14	4.969232	14
17	1	09	58	4.969085	13
18	1	04	40	4.968944	12
19	0	59	22	4.968822	11
20	0	54	02	4.968706	10
21	0	48	42	4.968602	9
22	0	43	20	4.968509	8
23	0	37	56	4.968427	7
24	0	32	32	4.968355	6
25	0	27	08	4.968294	5
26	0	21	44	4.968244	4
27	0	16	18	4.968206	3
28	0	10	52	4.968179	2
29	0	05	26	4.968162	1
30	0	00	00	4.968156	0
Sign 6				add.	

A Table of the Curtation of ♀, ♂, ♃, ♄, to be used with my System.

Curtation of Venus.				
Arg. Lat.	Signs 0 6	Signs 1 7	Signs 2 8	Arg. Lat.
0	0	190	570	30
1	0	201	581	29
2	1	213	592	28
3	2	225	601	27
4	4	237	614	26
5	6	250	624	25
6	8	262	634	24
7	11	275	644	23
8	15	288	653	22
9	19	301	662	21
10	23	314	671	20
11	28	327	679	19
12	33	340	687	18
13	38	353	695	17
14	44	366	702	16
15	51	380	709	15
16	58	393	716	14
17	65	406	721	13
18	72	420	727	12
19	80	433	732	11
20	89	446	737	10
21	97	459	741	9
22	106	472	745	8
23	116	485	749	7
24	125	497	752	6
25	135	510	754	5
26	146	522	756	4
27	156	534	758	3
28	167	548	759	2
29	178	558	760	1
30	190	570	760	0
	Signs 11 5	10 4	9 3	

The Table of the Curtation of ♀, ♂, ♃, and ♄, to be used with my System.

Curtation of Mars.				
Arg. Lat.	Signs	Signs	Signs	Arg. Lat.
	0	1	2	
	6	7	8	
0	0	56	170	30
1	0	60	173	29
2	0	64	176	28
3	1	67	180	27
4	1	71	183	26
5	2	74	186	25
6	2	78	189	24
7	3	82	192	23
8	4	86	195	22
9	5	90	197	21
10	7	93	200	20
11	8	97	202	19
12	10	101	205	18
13	11	105	207	17
14	13	109	209	16
15	15	113	211	15
16	17	117	213	14
17	19	121	215	13
18	22	125	217	12
19	24	129	218	11
20	27	133	220	10
21	29	137	221	9
22	32	141	222	8
23	34	144	223	7
24	37	148	224	6
25	40	152	225	5
26	43	155	225	4
27	47	159	226	3
28	50	163	226	2
29	53	166	226	1
30	56	170	226	0
	Signs	10	9	
	5	14	3	

The Table of the Curtation of ♄, ♂, ♀, and ♃, continued.

Arg. Lat. =	Curtation of Jupiter.			Arg. Lat. =
	Signs	Signs	Signs	
	0 6	1 7	2 8	
0	0	29	86	30
1	0	30	88	29
2	0	32	90	28
3	0	34	91	27
4	0	36	93	26
5	1	38	94	25
6	1	40	96	24
7	2	42	97	23
8	2	44	99	22
9	3	46	100	21
10	3	48	102	20
11	4	50	103	19
12	5	52	104	18
13	6	53	105	17
14	7	55	106	16
15	8	57	107	15
16	9	59	108	14
17	10	61	109	13
18	11	64	110	12
19	12	66	111	11
20	13	68	112	10
21	15	69	113	9
22	16	71	113	8
23	18	73	114	7
24	19	75	114	6
25	20	77	114	5
26	22	79	114	4
27	24	81	115	3
28	25	83	115	2
29	27	85	115	1
30	29	86	115	0
	11	10	9	
	5	4	3	

The Table of the Curtation of ♄, ♂, ♀, and ♃, continued.

Arg. Lat.	Curtation of Saturn.			Arg. Lat.
	Signs	Signs	Signs	
	0 6	1 7	2 8	
0	0	103	307	30
1	0	110	316	29
2	1	116	322	28
3	1	123	328	27
4	2	129	334	26
5	3	136	340	25
6	5	143	345	24
7	6	150	350	23
8	8	157	355	22
9	10	164	360	21
10	12	171	365	20
11	15	178	370	19
12	18	185	374	18
13	21	192	378	17
14	24	200	382	16
15	28	207	386	15
16	32	214	389	14
17	36	221	393	13
18	40	228	396	12
19	44	236	399	11
20	48	243	401	10
21	53	250	403	9
22	58	257	406	8
23	63	264	408	7
24	68	271	410	6
25	74	277	411	5
26	79	284	412	4
27	85	291	413	3
28	91	297	414	2
29	97	303	414	1
30	103	307	414	0
	Signs 11	Signs 10	Signs 9	
	5	4	5	

tinued.

A Table of the Inclination, Reduction and Curtation of φ .

Arg. Lat.	Sign o N. A. Sign o S. A. Inclination.			Reduc. Sub.		Curt sub.	Arg. Lat.
	o	'	"	l	"		
0	0	00	00	0	00	0	30
1	0	07	18	0	27	1	29
2	0	14	36	0	53	4	28
3	0	21	54	1	20	9	27
4	0	29	11	1	47	16	26
5	0	36	37	2	13	24	25
6	0	43	43	2	39	35	24
7	0	50	59	3	05	48	23
8	0	58	13	3	31	62	22
9	1	05	26	3	57	79	21
10	1	12	38	4	42	97	20
11	1	19	49	4	47	117	19
12	1	26	58	5	12	139	18
13	1	34	06	5	36	163	17
14	1	41	12	6	00	188	16
15	1	48	17	6	23	215	15
16	1	55	19	6	46	244	14
17	2	02	19	7	09	275	13
18	2	09	17	7	31	307	12
19	2	16	13	7	52	341	11
20	2	23	06	8	13	376	10
21	2	29	57	8	33	413	9
22	2	36	45	8	53	452	8
23	2	43	30	9	12	491	7
24	2	50	12	9	30	532	6
25	2	56	51	9	48	575	5
26	3	03	27	10	05	619	4
27	3	10	00	10	21	664	3
28	3	16	29	10	36	710	2
29	3	22	55	10	51	757	1
30	3	29	17	11	05	805	0
	Sign 11 S. D. 5 N.D.			Add.		sub.	

The Table of the Inclination, Reduction and Curtation of $\varnothing$
continued.

Arg. Lat.	Sign 1 N. A. Sign 7 S. A. Inclination.			Reduc. Sub.		Curt Sub.	Arg. Lat.
	°	'	"	'	"		
0	3	29	17	11	05	805	30
1	3	35	35	11	18	855	29
2	3	41	49	11	30	905	28
3	3	47	59	11	42	956	27
4	3	54	05	11	52	1008	26
5	4	00	07	12	02	1060	25
6	4	06	04	12	11	1114	24
7	4	11	58	12	19	1168	23
8	4	17	46	12	26	1222	22
9	4	23	30	12	32	1277	21
10	4	29	09	12	37	1333	20
11	4	34	43	12	41	1388	19
12	4	40	12	12	45	1444	18
13	4	45	36	12	47	1501	17
14	4	50	55	12	48	1557	16
15	4	55	09	12	49	1614	15
16	5	01	17	12	48	1670	14
17	5	06	19	12	47	1726	13
18	5	11	16	12	45	1783	12
19	5	16	08	12	42	1839	11
20	5	20	54	12	38	1895	10
21	5	25	34	12	33	1951	9
22	5	30	07	12	27	2006	8
23	5	34	35	12	20	2060	7
24	5	38	57	12	12	2114	6
25	5	43	13	12	03	2167	5
26	5	47	22	11	54	2220	4
27	5	51	25	11	44	2272	3
28	5	55	22	11	33	2325	2
29	5	59	12	11	20	2375	1
30	6	02	56	11	07	2425	0
Sign 10 S. D. 4 N. D.				Add.		Sub.	

The Table of the Inclination, Reduction and Curtation of ♄
continued.

Arg. Lat. ♄	Sign 2 N. A. Sign 8 S. A. Inclination.	Reduc. Sub.	Curt Sub.	Arg. Lat. ♄
0	6 02 56	11 07	2425	30
1	6 06 32	10 54	2473	29
2	6 10 02	10 39	2521	28
3	6 13 26	10 24	2567	27
4	6 16 42	10 07	2613	26
5	6 19 52	9 51	2657	25
6	6 22 55	9 33	2700	24
7	6 25 51	9 15	2741	23
8	6 28 40	8 56	2781	22
9	6 31 21	8 36	2820	21
10	6 33 56	8 16	2858	20
11	6 36 23	7 55	2894	19
12	6 38 43	7 33	2928	18
13	6 40 55	7 11	2960	17
14	6 43 01	6 49	2991	16
15	6 44 58	6 26	3021	15
16	6 46 49	6 02	3048	14
17	6 48 32	5 38	3074	13
18	6 50 07	5 14	3098	12
19	6 51 35	4 49	3120	11
20	6 52 56	4 24	3141	10
21	6 54 09	3 58	3159	9
22	6 55 14	3 33	3176	8
23	6 56 11	3 07	3191	7
24	6 57 01	2 40	3203	6
25	6 57 44	2 14	3214	5
26	6 58 18	1 47	3223	4
27	6 58 45	1 21	3230	3
28	6 59 04	0 54	3235	2
29	6 59 16	0 27	3238	1
30	6 59 20	0 00	3239	0
	Sign 9 S. D. 3 N. D.	Add.	Sub.	

C H A P. X.

To find the true Hour of the Night by the Fixed Stars.

FOR this purpose you must be provided with a good Quadrant that will take the Stars Altitudes to Minutes (or, if possible, to 15''); and because the Latitude of the Place of Observation must always be known, before you can find the Hour of the Night; it may be done by Sect. II. of my *Satellite-Astronomy*; which Figure I shall here make use of, in an Example of the Latitude taken by the Altitude of two known Stars, in order to find also the true Hour of the Night.

Example. Admit, Jan. 2, 1734, being in a certain Place, I observe the Altitude of *Capella* to be $71^{\circ} 30'$ short of the Meridian, and of the Head of *Andromeda* 46° . I demand the Latitude of the Place, and true Hour of the Night?

In my *System*, Page 228, I find the Longitude of *Capella* to be $\Pi 18^{\circ} 8'$, Latitude $22^{\circ} 52'$ North. From whence its Declination is $45^{\circ} 42'$ North, and its Right Ascension $74^{\circ} 15'$; The Longitude of *Andromeda's* Head, $\Upsilon 10^{\circ} 36'$, and Latitude $25^{\circ} 41'$ North, and consequently its Declination $27^{\circ} 37'$ North, and Right Ascension $358^{\circ} 40'$.

Now, for the Latitude of the Place of Observation.

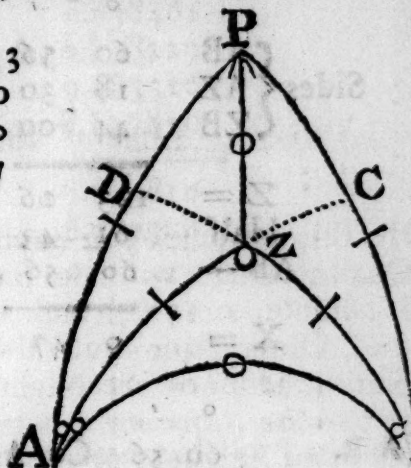
O P E R A T I O N.

From R A of <i>Capella</i>	74	15	+ 360°
Sub. R A of <i>Andromeda</i>	358	40	
Rem. $\angle A P B$	75	35	

First,

First, In the Triangle APB , for the Side AB .

As $c.t. PB$	62 23	6.718633
To Radius	90 00	10.000000
So $SC. \angle APB$	75 35	9.396150
To $t. DP$	25 27	9.677517
From AP	44 18	
Rem. AD	18 51	



As $C.S. DP$	25 27	Co. Ar.	0.044331
To $C.S. AD$	18 51		9.976060
So $C.S. BP$	62 23		9.666100
To $C.S. AB$	60 56		9.686491

Secondly, For the Angle ABP .

As $S. AB$	60 56	Co. Ar.	0.058461
To $S. \angle APB$	75 35		9.986124
So $S. AP$	44 18		9.844114
To $S. \angle ABP$	50 42		9.888699

Thirdly, For the Angle BAP .

As $S. AB$	60 56	Co. Ar.	0.058461
To $S. \angle APB$	75 35		9.986124
So $S. PB$	62 23		9.947465
To $S. \angle BAP$	79 4		9.992050

Fourthly,

First,

Fourthly, For the Angle $\angle ZAB$.

$$\begin{array}{rcl} \text{Sides } \left\{ \begin{array}{l} AB \\ AZ \\ ZB \end{array} \right. & \begin{array}{l} 60 \ 56 \\ 18 \ 30 \\ 44 \ 00 \end{array} & \end{array}$$

$$Z = 123 \ 26$$

$$\text{Half} \quad 61 \ 43$$

$$AB - \quad 60 \ 56$$

$$X = 0 \ 47$$

$$AZ \rightarrow 18 \ 30$$

$$X = 43 \ 18$$

S. A B.	60 56	Co. Ar.	0.058461
S. A Z.	18 30	Co. Ar.	0.498524
S. X.	43 13		9.835538
S. X.	00 47		8.135810

Sum Logarithms

18 528333

Half is the Sine $10^{\circ} 35'$

9.264166

Double sub. $21 \ 10 = \angle ZAB$.

From the $\angle BAP$ 79 4

Rem. the $\angle ZAP$ 57 54

Fifthly, For the Angle $\angle ZBA$.

$$\begin{array}{rcl} \text{Sides } \left\{ \begin{array}{l} AB \\ ZB \\ AZ \end{array} \right. & \begin{array}{l} 60 \ 56 \\ 44 \ 00 \\ 18 \ 30 \end{array} & \end{array}$$

$$Z = 123 \ 26$$

$$\text{Half} \quad 61 \ 43$$

$$AB \quad 60 \ 56$$

$$X = 00 \ 47$$

$$ZB \quad 44 \ 00$$

$$X \quad 17 \ 4$$

S. A
S. Z
S. X
S. X

Sum
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Rem.

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To C.S
From

Rem.

S. A

S. AB	60	56	Co. Ar.	0.058461
S. ZB	44	00	Co. Ar.	0.158229
S. X	17	43		9.483316
S. X	0	47		8.135810

Sum Logarithms 17.835816

$\frac{1}{2}$ Sine is 4 45 8.917908

Double is 9 30 = $\angle$ ZBA.

From ABP 50 42

Rem. 41 12 = $\angle$ PBZ.

6. For the Side ZP, the Complement of the Latitude,

In the Oblique-angled Spheric Triangle PZB, there are known ZB, the Complement of the Altitude of the Head of *Andromeda* 44° , PB the Complement of the same Star's Declination $62^\circ 23'$, and the Angle ZPB $41^\circ 12'$ (found in the last Operation) to find the Side ZP, the Complement of the Latitude of the Place.

See the Work.

As C.t. Z B —	44 00	10.015162
To Radius	90 00	10.000000
So S.C. $\angle$ ZBP	41 12	9.876457
To t. BC sub.	36 00	9.861295
From B P	62 23	

Remains C P 26 23

As C.S. BC	36 00	Co. Ar.	0.092042
To C.S. CP	26 23		9.952231
So C.S. ZB	44 00		9.856934
To C.S. ZP	37 12		9.901207
From	90 00		

Rem. Latitude 52 48 North.

The

The Angles at the Zenith are,

Angle	{ A Z B	152	59	
	{ P Z B	105	08	
	{ P Z A	101	53	
Z		360	00	Proof.

Secondly, For the true Hour of the Night.

The Right Ascension of the Sun is increased daily about 4 Minutes in Time ; so that if your Meridian differ from that of *London* 6 Hours in Time, then the Right Ascension will differ one Minute. If the Difference of the Meridians be 12 Hours, the Sun's Right Ascension will differ 2 Minutes ; if the Meridian differ 18 Hours from *London*, the Sun's Right Ascension will differ 3 Minutes ; and so one Revolution round the Globe is equal to the Sun's Diurnal Motion near one Degree, which is equal to 4 Minutes in Time, performed in near 24 Hours.

If your Place lie to the East of *London*, the Sun's Right Ascension, proportioned as above, must be subtracted from the Sun's Right Ascension at *London* at the same Hour : But if you are to the West of *London*, the Minutes of the Sun's Right Ascension must be added to the Sun's Right Ascension at *London* at the same Hour.

As for instance ; suppose *January 2*, at Noon, under the Meridian of *London* the Sun's Right Ascension be 19 Hours 41 Minutes ; what is the Sun's Right Ascension at *Fort St. George* in the *East Indies*, and *Port Royal* in *Jamaica* at Noon ?

Hence, because the first Place lies 5 Hours, 24 Minutes to the East, and the latter lies 5 Hours, 4 Minutes to the West of *London*, therefore I subtract for the first Place 1 Minute, and for the second add 1 Minute to and from the Sun's Right Ascension at *London* that Day at Noon, and I have the Sun's Right Ascension at those Places severally the same Day at Noon, as follows,

Jan. 2.

Jan. 2. at Noon Sun's $\S$ Port St. George
Right Ascension at $\angle$ Port Royal

h.

19 40

19 42

The like is to be observed at any other Time and Place.

2. The Right Ascension of the Fixed Stars alter but little for several Years: Therefore as you find them in my System, &c. so may you use them without any sensible Error, for this Age.

For as the Difference of Meridian Altitudes of any two Stars gives the Difference of their Declination; so the difference of the time of their Transits over the Meridian is the difference of their Right Ascensions; and by having the Latitude of the Place, and the Meridian Altitude of any Star, you have also its Declination given, and *vice versa*.

Here you must also note, that all the Heavenly Bodies have the same Altitude that they have at London, if you are in the same Parallel, altho' distant 180° East or West, at the same Hour of the Day or Night.

As, for instance; suppose you observe *Arcturus* to have 30° of Altitude at 9 a-Clock at Night at London: I say, he has the same Altitude at 9 at Night in the Latitude of London, altho' the Place be East or West 90° Degrees, more or less from London: and this Property belongs to all the Heavenly Bodies.

What I have said upon this Head, generally belongs to Seamen and Travellers: But to those that live any where in England, the Meridian-Distance is but little from London East or West; there needs not any such allowance for the Sun's Right Ascension to be made.

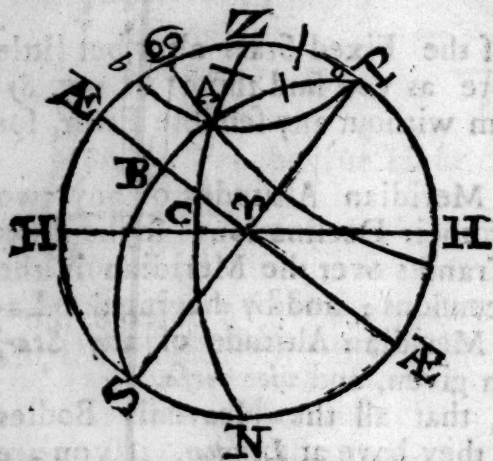
Now, in order to find the true Hour of the Night, you must first find the time of the Star's southing; which is done, by subtracting the Sun's Right Ascension from the Star's, borrowing 24 Hours, if need require; and then, having taken the Star's Altitude, and from it subtracted the Refraction answering, you must project the Oblique-angled Spheric Triangle, in which there are given AZ, the Complement of the Star's Altitude, AP, the Complement of the Star's Declination, and ZP, the Complement of the Latitude of the Place, to find the Angle at the Pole, which is the time between the Star's southing, and the time you are seeking; which, if the Star be short of the Meridian, must be subtracted

K

cted

ded from the time of southing; but if the *Star* be past the Meridian, the Angle at the Pole must be added to the time of the *Star's* southing; the Sum, or Difference is the true Hour of the Night.

Example. Admit, Jan. 2, 1734, in the Latitude of $52^{\circ} 48'$, the Altitude of the Head of *Andromeda* was observed 46 Degrees past the Meridian. I demand the true Hour of the Night?



OPERATION.

Right Ascension of the Star,
Right Ascension of the Sun,

h. ' "

23 55

19 40

Remains the time of Southing,

4 15

Now for the Angle ZPA.

Sides { AP 62 23
AZ 44 00
ZP 37 12

Z = 143 35

Half = 71 47

AP = 62 23

X = 9 24

ZP = 37 12

X = 34 35

SAP

SAP	62	23	Co Ar.	0.052533
SZP	37	12	Co Ar.	0.218533
SX	24	35		9.754046
SX	9	24		9.213055
Z Logarithms	—	—		19.238167
Half Z=S. 24	35	—		9.619083
Double	49	10	= $\angle$ ZPA =	h. " "
Time of Southing add				3 12 40
				4 15 00
True Hour of the Night				7 27 40

Example 2. Admit at London, Jan. 18, I observe the Altitude of Pollux to be 50° short of the Meridian. I demand the true Hour of the Night?

The above-mentioned Scheme may serve our turns well enough for this purpose. In which, let AZ be the Complement of the Star's Altitude 40° , AP the Complement of its Declination, $61^\circ 21'$, ZP the Complement of the Latitude of London, the Place of Observation $38^\circ 28'$, to find the Angle at the Pole?

First, For the time of Southing.

Right Ascension of the Star, 7 28

Right Ascension of the Sun sub. 10 47

Time of Southing = 14 19

And now I am upon Explaining how to find our true Time, it will not be amiss to say a Word or two to those whole Bubbles it is to look after Time-keepers, as Clock and Watch-makers, every one of which generally has a Movement which they call a Watch. This is their standard, by which they set Gentlemen's Watches. I am very sensible there are not Two of these Regulators in London the same Time; yet they all tell you they are right, and that each his Machine keeps Time to a Miracle. But alas! when I come to enquire into the Foundation of their Time

For the $\angle$ at the Pole.

Sides	{	AP	61	21			
		AZ	40	00			
		ZP	38	28			
		Z	139	49			
		Half	69	54			
		AP =	61	21			
		X =	8	33			
S. AP	61	21	Co Ar.	0.056721			
S. ZP	38	28	Co. Ar.	0.206168			
S. X	31	26		9.717259			
S. X	8	33		9.172230			
Z Logarithms				19.152378			
Half S.	22	08		9.576189			
Doubled	44	16	= $\angle$ ZPA =	2 57 4	subtract.		
From the time of Southing				10 41 0			
True time of the Night				7 43 56			

Thus you see, how readily and exactly may the Hour of the Night be found at any Time and Place, when the Stars are seen; or by the Moon and other Planets: But then it will require more Labour, because of their swift Motion in Longitude. But when their true Declinations and Right Ascensions are found, the Work is the same, (except the Moon) in finding the $\angle$ at the Pole, the time of Southing, and from thence, the true Hour of the Night.

And now I am upon Explaining how to find out true Time, it will not be amiss to say a Word or two to those whose Business it is to look after Time-keepers, as Clock and Watch-makers, every one of which generally has a Movement, which they call a *Regulator*. This is their Standard, by which they set Gentlemens Watches. I am very sensible there are not Two of these Regulators in London the same Time; yet they all tell you they are right, and that each his Machine keeps Time to a Miracle. But alas! when I come to enquire into the Foundation of their Time,

by

by what they have set their Regulator, one says, he set his by *St. Paul's Clock*, another by the *Royal Exchange-Clock*, another by the Dial in *Gray's Inn Walks*, another by *Coven-Garden Dial*, on a Day when there was no Equation; another sets his by the *Temple-Dial*; and possibly, another by some Dial on an House-side. Indeed, a Dial well made, and truly set, will keep apparent Time true enough; but I know not one, altho' he can make the Dial ever so well, that can set it true when he has done; so that if the Dial be ever so truly made, if it is not truly set, it will give you wrong Time; and consequently, all Movements set by such Dials must of necessity err, altho' the Movement will keep good Time to what it was set; yet because it was set upon a wrong Basis, the Time shewn by it is false, as I have daily proved.

Now to put them all to rights, they must learn so much of Astronomy, as will inform them of this matter, my *System*, Vol. I. Prob. 17. and this Book will give any one ample satisfaction.

Now, to make this intelligible to the meanest Capacity; those that are minded to be Masters hereof, must be provided with a good *Astronomical Quadrant*, as mentioned at the beginning of this Chapter, and is hereafter more largely described; and then, by the Latitude of the Place, and Altitude of the Sun or Star, the true Hour of the Day or Night may be found, which is the apparent Time; and because good Clocks and Watches keep equal Time, wharever the Equation of Time is, set your Regulator accordingly.

Then on any of Days when the Equation vanishes, make Observation, and see if your Regulator and the Sun be together; if they are, then is the Regulator right; else not.

Make Observation on the Day when the Equation is the greatest; as, suppose at the latter End of *January*, if then the Regulator be 14 Minutes, 41 Seconds too fast for the Time observed, then is your Regulator right, else not.

And thus may you prove it any Day or Night at pleasure, and keep it to that just Time, that it may be a perfect true Regulator.

There is but one thing more which I have to remind my Reader of in this Affair; which is, if he sets his Regulator by a Sun-Dial, it ought not to be done early in the Morning, or late in the Afternoon: For then the Shadow on the Dial is not the true Hour of the Day, in regard the Sun hath then considerable Refraction, which makes the Sun appear higher than really he is; and the nearer the Horizon, the greater is this Error of Time shewn by the Dial: so that all Sun-Dials go too fast in the Forenoon, and too slow in the Afternoon, be they ever so well made and truly set.

Therefore if you are sure of such a Dial's Truth, then if it is an Horizontal or South Erect-Direct Dial, set your Regulators as near Noon as possible: For the Refraction is the least, and consequently the Time is then the truest.

But if you are to observe the Time by the Direction above-given, let the Sun or Star (if possible) be an Hour and half, or two Hours from the Meridian; for the Altitude from Ten in the Morning, till Two in the Afternoon alters but little, viz. in a Ratio proportional to the Natural Sines.

CHAP.

How

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CHAP. XI.

How to observe the Sun's true Place, other Ways than is shewn in the 41st Problem of my System.

IN the 5th Page of this Book I have told you, that these Observations were taken with a new-invented Quadrant answering to a Radius of 270 Feet. Which Quadrant is made by Mr. John Barston of Chelsea, Watch-maker (where any Gentlemen may have them, either with, or without Seconds) and has been try'd by several able Astronomers and Navigators, being found to answer most exactly its intended Ends, and to excel all others in these following Particulars, *viz.*

1. It requires no Shade from the Sun :
2. Nor any visible Horizon.
3. 'Tis not so liable to be affected by the Motion of the Ship.
4. An Observation may be taken with it in the Night (of which there are more frequent Opportunities than in the Day) either of the Moon or Fixed Stars, and the Latitude be thereby exactly determin'd.
5. In this Instrument there is nothing required, but that you see the Object, *viz.* Sun, Moon or Star : Whereas in all the Instruments now used, there are more things than one required, to be seen at the time of taking the Observation ; besides the Difficulty of moving the sliding Pieces with the Finger, which, while the Observator is doing, the Opportunity of taking the Observation is many times lost.
6. It divides a Degree into 60 equal Parts, and thereby the Altitude is determin'd to a Minute, and consequently the Latitude of the Place to a Mile at Sea.

That it does really excel all others in the foresaid Particulars, has never been questioned by any who has seen it, and is an experienc'd Navigator: And it has been affirmed by several, that had there been such an Instrument in use in the time of Sir Cloudefly Shovell, the Loss of that Honourable Gentleman, and of all those unfortunate Persons who were with him, had been prevented.

Therefore I recommend it to all Astronomers and Navigators, as the most useful Instrument that was ever yet made.

One of these made	18	Inches Diameter.	270 Feet:
	15	Answers to the Radius of one made	225
	12	the common way	180
	9		135
	6		90
	3		45
	2		30
	1		15

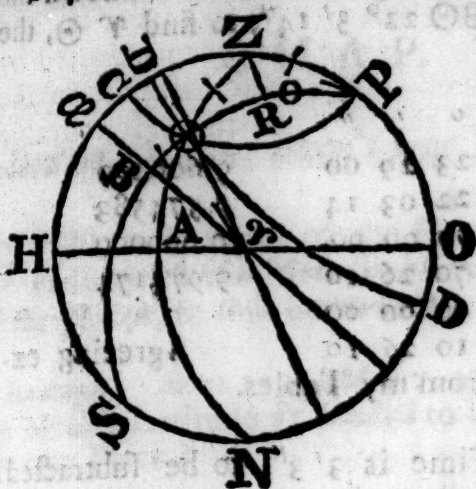
Given, the Latitude of the Place, the Hour of the Day, and the Sun's true Altitude; to find the Sun's true Place in the Ecliptic?

Example. At London, ♀ May 21, 1731, at 2 Hours P. M. Apparent Time, I observed. the Sun's apparent Altitude 52 Degrees, 13 Minutes, 15 Seconds. I demand the Sun's true Place?

OPERATION.

Apparent Altitude	52	30	15
Refraction sub.			41
True Altitude	52	29	34

Draw the Primitive Circle ZHO, quarter it;



and draw HQ for the Ho-
rizon; set off the Lati-
tude $51^{\circ} 32'$ from O to
 P , and from Z to α draw
 $\alpha \gamma$ for the Equinoctial;
with the Secant of 30°
(the time from Noon) draw
 PBS ; and with the Co-
Tangent of the Altitude
 $37^{\circ} 30' 16''$ draw the Pa-
rallel of Altitude $CO P$;
where this cuts the Meri-
dian $P \odot S$, which is at $\odot$,
draw the Azimuth $Z \odot N$;

And now there are given (1.) ZP the Complement of the Latitude $38^{\circ} 28'$, (2.) Z $\odot$ the Complement of the Sun's Altitude $37^{\circ} 30' 26''$, with the time from Noon = $\angle \odot PZ$ 30° , to find the Side $\odot P$ the Complement of the Sun's true Declination. Let fall the Perpendicular ZR, and then say,

As C. t.	—	38 28 00	10.099913
To Radius		90 00 00	10.000000
So C.S. $\angle$ P		30 00 00	9.937531
To t. RP		34 31 47	9.837618

As C.S. ZP	38 28 00	Co Ar.	0.106255
To C.S. Z⊙	37 30 26		9.899425
So C.S. RP	34 31 47		9.915139
To C.S. ⊙R	33 24 59		9.921519
Z Sub.	67 56 46		
From	90 00 00		

Sun's true Decl. = $\odot$ 22 3 14 North,

Now,

Now in the Rect-angled Triangle $\gamma B \odot$ are known the Angle $B \gamma \odot 23^{\circ} 29'$, and $B \odot 22^{\circ} 3' 14''$, to find $\gamma \odot$, the Sun's true Longitude?

As S. $\angle B \gamma \odot$	23 29 00	9.600409
To $SB \odot$	22 03 14	9.574583
So Radius	90 00 00	10.000000
To $S \gamma \odot$	70 26 10	9.974174
Sub. 2 Signs = II	60 00 00	
Sun in II	10 26 10	Agreeing ex-
actly with the Calculation from my Tables.		

Note, The Equation of Time is $3' 3''$, to be subtracted from apparent Time.

When the Sun is more than 45 Degrees from the Equinoctial Points, the Sines encrease so very flow, that a few Seconds in the Declination make a considerable Alteration in the Sun's Place; so that it requires exquisite Instruments to make the Observations withal.

CHAP.

C H A P. XII.

How to find the Moon's true Place by Observation.

GIVEN the Latitude of the Place, the Hour of Observation, with the Moon's observ'd Altitude, and the Place of the Nodes, to find her true Place ?

Example: Anno 1731, May 7, at 10, at Night, I observ'd the Moon's Latitude at London to be $23^{\circ} 59' 10''$; what is her true Place ?

The true Place of her North Node was then $98, 8^{\circ} 48' 57''$.

Before I proceed to the Solution of this Problem, I shall explain two useful Cases in Sphericks, which are these:

1. Given two Sides, with the Angles opposite to them, to find the third Side.

R U L E.

As the Sine of half the Difference of the given Angles,
To the Sine of half the Sum of those Angles;
So is the Tangent of half the Difference of the given Sides,
To the Tangent of half the Side required.

2. Given two Angles, and the Sides opposite to them to find the other Angle.

R U L E.

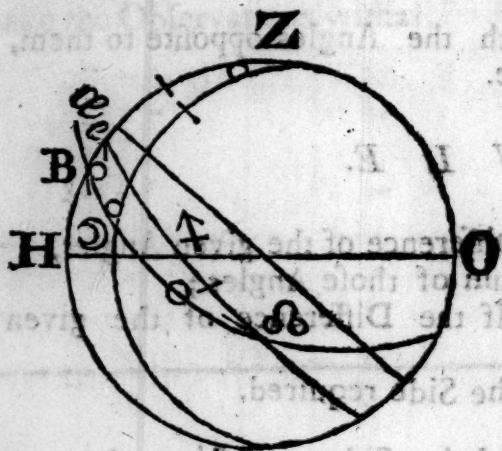
As the Sine of half the Difference of the given Sides,
To the Sine of half the Sum of those Sides;
So is the Tangent of half the Difference of the given $\angle$;
To the Co-Tangent of half the $\angle$ required.

And

And the three sides of any Spheric Triangle are less than a Circle, or 360° : Also the three Angles taken together, are greater than two Right, or 180° .

Now, to proceed to the Solution of the Problem for the Moon's Place, thus:

	D.	h.	'	"
Anno 1731,	7	10	00	00
Equat. of Time add	0	00	04	01
Apparent Time	7	10	04	01
Sun's Place	♊	27	19	43
Sun's Right Asc.	55	02	20	
App. Time from Noon	151	00	15	
R. A. M. Cali	206	02	35	
Medium Cali	28	02	55	
Meridian Angle	69	01	17	
Decl. Culm. Point South	10	47	58	
Inclin. Orb = $\angle \Omega \Omega e$	5	09	04	



In this Scheme the Moon is past the Meridian by the Distance $B\Omega$; which is the reason that $B\Omega$ is added to ΩB in the following Work.

1. In the Triangle $B\Omega e$ are known, (1.) Ωe the Distance of the culminating Point from the nearest Node = $28^\circ 10' 46''$
 2. (2.) The $\angle B\Omega e = 5^\circ 9' 4''$, the Obliquity of the Orb,
 (3.) The Angle $B e \Omega$, the Meridian Angle $69^\circ 1' 17''$; to find the Angle $\Omega B e$, the Angle that the Moon's Orb makes with the Meridian, and the Sides ΩB and $B e$. By the 3d Axiom of Oblique Sphericks,

1. For the Sides.

Angle $B e \Omega$ 69 01 17Angle $B \Omega e$ 5 09 04

Z 74 10 21

Half 37 05 10½

X 63 53 13

Half 31 56 06½

Side Ωe 70° 46' 02"

Half 35 23 01

As S. Half Z $\angle$ L 37 05 10 Co Ar. 0.219672

To S Half X 31 56 06 9.723420

So s. Half Cr. Ωe 35 23 01 9.851440

To s. Half X of unknown Crs. 31 55 32 9.794532

2. As C.S. Half $\angle$ L 37 05 10 Co Ar. 0.098167

To C.S. Half X 31 56 06 9.928730

So s. Half Cr. Ωe 35 23 01 9.851440

To s. Half unknown Crs. 37 04 38 9.878337

Half X — and + 31 55 32

Rem. B e 5 09 06

Sum is the side Ω 69 00 103. For the Angle $\Omega B e$, which the Moon's Orb makes with the Meridian,As S. B Ω 69 00 10 Co Ar. 0.029839To S. $\angle$ B e Ω 61 01 17 9.970214So s. Ωe 70 46 02 9.975058To s. $\angle$ $\Omega B e$ 70 47 12 9.975111

Moon's

Moon's Altitude observ'd	23	59	10
Parallax Altitude +	0	50	57
Sum	24	50	7
Refraction subtract	0	1	59
True Altitude	24	48	8
Complement = $\angle Z$	65	11	52

4. In the Triangle ZDB , to find the Angle $\angle$, the Parallax Angle in the Moon's Orb.

As S. $\angle Z$	65	11	52	Co Ar.	0.042029
To S. $\angle B$	70	47	12		9.975110
So S. BZ	67	29	4		9.965566
To S. $\angle$	73	56	15		9.982705
Complement	106	3	45	Obruse = Angle $\angle B$	

To $e \propto$ Decl.	10	47	58
Add $B e$	5	9	6
$Z = B e$	15	57	4
$\angle \propto R$	51	32	0
$\angle = B \angle$	67	29	4

5. To find the Side $\angle B$, the Operation stands thus:

Angle $\angle B$	106	03	45	—	106	3	45	$\angle B$	67	29	4	
Angle $\angle B$	70	47	12	—	70	47	12	$\angle$	65	11	52	
$\angle$	176	50	57		X	35	16	33	X	2	17	12
Half	88	25	28 $\frac{1}{2}$		Half	17	38	16 $\frac{1}{2}$	Half	1	8	36

As S. half X of the given Angles	17	38	16	Co. Ar.	0.518558
To S. half their $\angle$	88	25	28		9.999836
So $\angle$ half given sides	1	8	36		8.300000
To $\angle$ half $\angle B$ required	3	46	27		8.818400
Double is the side $\angle B$	7	32	54	past the Merid.	
Add $\angle$	69	00	10		
Sum is $\angle B$	76	33	4	$\angle$'s Dist. à Node	

Place

	S.	°	'	"
Place of the Node	9	8	48	57
Moon's Distance from Node sub.	2	16	33	4
Rem. Orbit Place of the Moon	6	22	15	53
Moon's Orbit-Pl. from New Tables	6	22	17	13
Difference	1	20		

Thus have I given two practicable Methods, by which the true Places of the Sun and Moon may be found by Observation at any Place in the World ; which, if at the same Hour their Places are calculated from my new Tables, Difference of Meridians between that and *London* may be exactly determined.

Example. Suppose I am at *Jamaica* the 6th Day of *July* 1731, at half an hour past 10 at Night, and observe the Moon's Orbit Place (by the foregoing Method) to be $7^{\circ} 35' 3''$; at the same Hour I compute the Moon's Place from my New Tables, under the Meridian of *London*, and find her Place to be $4^{\circ} 28'$. I demand the Difference of Longitude from *London* ?

OPERATION.

Moon's Orbit { *Jamaica* $7^{\circ} 35' 03''$ }
Place at { *London* $4^{\circ} 28' 00''$ } at 10 at Night.

Difference $3^{\circ} 7' 3''$

Now say, If the Moon's Diurnal Motion give 24 Hours, or 360° (either will do,) what will the Difference of the Moon's Place give ? What comes out, is the Difference of Meridians, if you took 24 Hours for the middle Term ; or the Difference of Longitude in Degrees, if 360° was the middle Term.

Now

Now say,

If 14 46 : 360 :: 3 7 3

60

60

886

187

60

60

53160

11223

360

673380

33669

53160)4040280(76

37212

31968

31896

120

60

)7200(0' 11 13

Answer 76° *Jamaica* lies to the West of *London*.

Example 2. Admit at *Fort St. George* in the *East Indies*, on the 24th of *August* 1731, at 6 h. 15 min. P. M. the Moon be observed in *Libra* $14^{\circ} 98'$ and at 6 h. 15 min. at *London*. I find by Calculation her Place to be *Libra* $17^{\circ} 24'$. I demand the Difference of Longitude betwixt *London* and *Fort St. George*?

OPERATION.

Moon's Orbit $\left\{ \begin{array}{l} \text{London} \\ \text{Place at} \end{array} \right. \left\{ \begin{array}{l} \text{Fort St. George} \end{array} \right. \begin{array}{l} \approx 17^{\circ} 24' \\ \approx 14 38 \end{array} \left. \right\} \text{at 6h. 15' P.M.}$

Difference

2 46

The

The Moon's Diurnal Motion is $12^{\circ} 17'$. Now say,

$$\begin{array}{r}
 \text{If } 12^{\circ} 17' : 360^{\circ} :: 2^{\circ} 46' \\
 \hline
 60 \qquad \qquad \qquad 60 \\
 \hline
 737 \qquad \qquad \qquad 166 \\
 \hline
 \qquad \qquad \qquad 360 \\
 \hline
 \qquad \qquad \qquad 9960 \\
 \qquad \qquad \qquad 498 \\
 \hline
 737) 59760 (81^{\circ} \\
 \underline{5896} \\
 800 \\
 737 \\
 \hline
 63
 \end{array}$$

Answer, 81° Degrees to the East of *London*.

By the foregoing Examples it is plain, that if the Moon's Place observed, be less than it is at *London*, by Calculation for the same time, then the Meridian of the Observation lies to the East of the Meridian of *London*; if it be the same, then the Observer is under the Meridian of *London*; but if it be more than at *London*, the Place of the Observation is to the West.

And the reason is very obvious: For the Longitude of any Place from *London* is always equal to that which is measured out by the Motion of the Moon, &c. in the time that is elapsed between one Meridian and another: As in the last Example, I have found the Difference of Longitude to be $81^{\circ} = 5 \text{ h. } 24'$. Now the Motion of the Moon in that time is $2^{\circ} 46'$, according to her Diurnal Motion of $12^{\circ} 17'$.

And here I give you to understand, that for every Minute that you miss of the Truth of the Moon's Place, you will err 27 Miles in Longitude, according to the Mean Motion of the Moon, as I thus prove:

$$\text{If } 13^{\circ} 10' 35'' : 360^{\circ} :: 1' : 27'$$

L

2. The

The

2. The Longitude of any Place from *London* may be found by observing the time the Moon is upon the Meridian of that particular Place : For if you find the time of the Moon's Southing where you are to be, the same that it is at *London*, then you are under the Meridian of *London*; but if the time where you are be less than at *London*, you are to the East; if more, to the West.

Therefore if there be any Difference, turn it into Degrees, and then say,

As the Moon's Diurnal Motion, is to 360° , what is this Difference, to work by a direct Ratio, and what comes out, is the Difference of Longitude.

Example. Admit, Jan. 9, 1731, I am at Sea, in the Latitude of $43^{\circ} \frac{1}{2}$ North, and observe the Moon upon the Meridian of the Place at 10 h. 17' P.M. apparent Time. I demand the Longitude of Observation from *London*, and of what Denomination?

OPERATION.

		h.	'
Moon South at	<i>London</i>	10	17
	observed	10	5
		0	12 = 3°

Now say,

As $11^{\circ} 48' : 360^{\circ} :: 3 : 91^{\circ} 31'$ to the East of *London*.

N. B. This way of Reasoning will require most accurate Instruments, and the greatest Care imaginable, in using of them : For every Minute in Time that you err in the time of the Moon's Southing, will produce an Error of 408 Miles in Longitude, according to the middle Motion of the Moon, thus proved :

As

As 13 10 35 : 360 :: 15 : 408 Miles.

Note, 1 in Time is equal to 15^l in Motion, which is here the third Term.

CHAP. XIII.

To find the Moon's Visible Place.

THE Place of the Moon (and of all the Heavenly Bodies) is calculated as view'd from the Earth's Center, and this is called the *True Place*: But because we are removed from thence 3984.58 Miles, when we view the Moon from the Earth's Surface, we do not behold her in the same Place as an Eye would do from its Center; therefore my Business in this place shall be to reconcile this matter, and make the whole Process as intelligible as possible.

When the Moon has no Latitude, then the 39th Problem of my *System* will answer your End: But because she has generally Latitude, more or less, it will render the Calculation a little more intricate (than is there shewn,) as will appear by the subsequent Example.

Anno 1727, September 15th, at 10 at Night, at London, Apparent Time. I would know the Moon's Visible Place in Longitude and Latitude?

This being a Problem perfectly new, and attended with some Difficulty, I shall endeavour to make it as plain as possible to the meanest Capacity.

1. With the true Place of the Node $11^{\circ} 21' 37'' 58''$, take out the Inclination of the Moon's Orb, with the Equinoctial (Page 71, of my *System*) $28^{\circ} 16' 44''$; and then set down the Requisites, thus:

L 2

Given

	D.	h.	'	"
Given Apparent Time 1727, September	15	08	00	00
Equation of Time sub.	—	—	08	46
Equal Time	15	07	51	14
Moon's Orbit Place from New Tables	≈	25	07	47
Reduction add	—	—	05	49
Ecliptic Place	≈	25	13	36
Moon's true Latitude South Deces.	2	21	06	
Sun's true Place,	≈	3	06	59
Sun's Right Ascension	182	51	31	
Moon's Right Ascension	32	19	46	
Apparent Time from Noon add	120	00	00	
Sum is Right Ascension M. Cali	302	51	31	
Complement	57	08	29	
Angle of Moon's Orb with the Equinoctial	28	16	44	

Now, for the *Medium Cali* in the Moon's Orb, &c. by Problems 27, 28, 29, 30, 31, 32, 33, of my *System*. Find the Requisites, only here make use of the Obliquity of the Moon's Orb $28^{\circ} 16' 44''$, instead of the Obliquity of the Ecliptic $23^{\circ} 29'$.

	°	'	"	
As Radius	90	00	00	10.000000
To C.S. Obliquity of ☾'s Orb	28	16	44	9.944850
So C.t. R.A. M. Cali	57	08	29	9.810168
To C.t. of its Dist. from ☿ sub.	60	21	57	9.755018
From Aries, or	125.	00	00	00
Rem. ☾'s Orbit Place on Merid.	9	29	38	03
But in the Ecliptic	≈	00	38	35

2. For the Meridian Angle in the Moon's Orb.

	°	'	"	
As Radius	90	00	00	10.000000
To S. Obliquity Orb	28	16	44	9.675561
So C.S. R.A. M.C.	57	08	29	9.734454
To C.S. Merid. Angle ☾'s Orb	75	06	18	9.410015

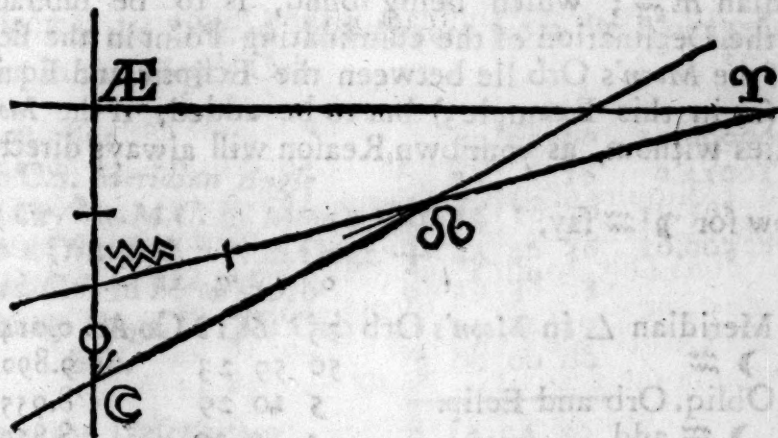
3. To

3. To find the Declination of the culminating Point in the Ecliptic.

As Radius	—	90 00 00	10.000000
To T. Obliq. of the Eclip.		23 29 00	9.637956
So S. R. A. M.C. in Eclip.		57 08 29	9.924286
To ϵ . Declin. Culm. Point		20 03 00	9.392242

4. To find the Declination of the Culminating Point in the Moon's Orb.

First, Find the same Point's Declination in the Ecliptic, as in the Third above; and also the *Medium Cali* in the Ecliptic, which in this Example is $\approx 0^\circ 38' 35''$; from which Place in the Ecliptic, always subtract the Place of the nearest Node, and you will have the Distance of the said Node in



the *Medium Cali* in the Ecliptic, which in this Scheme is equal to $\Omega \approx 15.20^\circ 59' 23''$, the Angle $\Omega \gamma \approx$ is the Meridian Angle in the Moon's Orb = $75^\circ 6' 18''$ found in the Second, and the Angle $\gamma \Omega \approx$ is $5^\circ 10' 29''$, being the Inclination of the Moon's Orb and Ecliptic, and is thus obtained :

3. To

L 3

As

	°	'	"	
As Radius	90	00	00	10.000000
To S. greatest X of Obliqu.	0	17	45	7.712791
So S. Dist. $\searrow$ $\odot$	37	53	23	9.788270
To S. add	0	10	54	7.501061

Now you are to observe, that if the Distance of the Moon from the Sun

	°	'	"	
be { 3, 4, 5, 9, 10, 11 Signs, add to	4	59	35	the
{ 0, 1, 2, 6, 7, 8 Signs, sub. from	5	17	20	

Sum or Difference is the true Obliquity of the Moon's Orb with the Ecliptic at that time.

So in the Example above it is $5^{\circ} 10' 29''$.

Now in the Triangle $\triangle$ $\searrow$ $\approx$ we are to find $\searrow$ $\approx$, which is the Distance of the Moon's Orb from the Ecliptic upon the Meridian $\approx$ $\approx$; which being found, is to be subtracted from the Declination of the culminating Point in the Ecliptic, if the Moon's Orb lie between the Ecliptic and Equinoctial (as in this Example;) but to be added, if the Moon's Orb lies without, as your own Reason will always direct.

Now for $\searrow$ $\approx$ say,

	°	'	"	
As S. Meridian $\angle$ in Moon's Orb	75	6	18	Co Ar. 0.014844
To S. $\searrow$ $\approx$	50	59	23	9.890439
So S. Obliq. Orb and Eclip.	5	10	29	8.955129
To S. $\searrow$ $\approx$ add	4	9	30	8.860412

Now, because the Angle of the Moon's Way with the Equinoctial is more than the Obliquity of the Ecliptic, $\searrow$ $\approx$ must be added to $\approx$ $\approx$. See the Table in my System, Pages 71, 72.

To $\mathcal{A} \approx$, as found in the *Third*Add $\approx$)

20 00 00

4 09 30

Sum is $\mathcal{A} \approx$, the Declination of }
the Culm. Point in $\approx$'s Orb }

24 09 30

Alt. Equator at *London*,

38 28 00

Alt. M.C. in the *Moon's* Orb

14 18 30

4. For the Altitude of the Nonagesime Degree in the *Moon's* Orb.

As Radius

90 00 00

10.000000

To S. Meridian Angle

75 6 18

9.985156

So C.S. Alt. M.C. in *Moon's* Orb

14 18 30

9.986319

To C.S. Alt. Nonages. Degr.

20 32 22

9.971475

5. For the Dist. of *Mid-Heaven* from the Nonagesime Degree in the *Moon's* Orb.

As Radius

90 00 00

10.000000

To C.S. Meridian Angle

75 6 18

9.410015

So C.S. Alt. M.C. in *Moon's* Orb

14 18 30

10.593372

To *t.* Dist. M.C. a Non. Degr. +

44 46 36

10.003387

Med. Celi in *Moon's* Orb9^s. 29 38 3Nonag. Degr. in $\approx$'s Orb

11 14 24 39

Sub.

3 00 00 00

Rem. the Descendant

8 14 24 39

Moon's true Orbit Place

10 25 7 47

Rem. $\approx$ from the Descend.

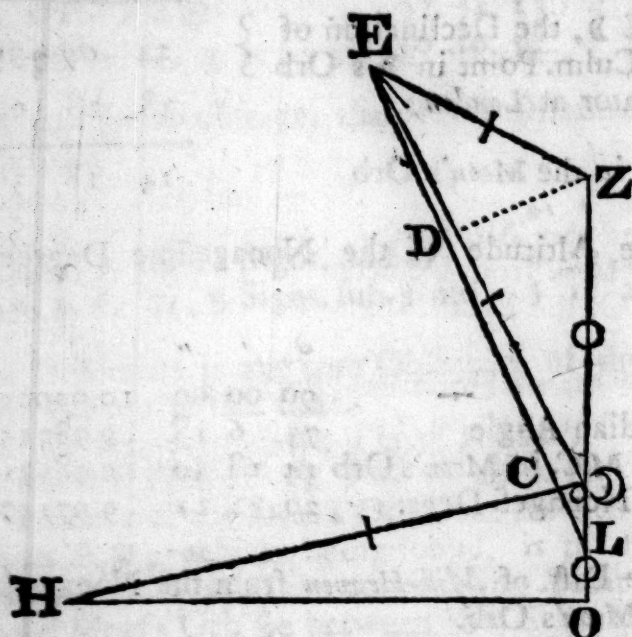
2 10 43 8

From the Nonag. Degree

0 19 16 52

6. To find the Moon's true Altitude.

In this Scheme, E represents the Pole of the Moon's Orb,



Z the Zenith, $\textcircled{D}$ the true, and L the visible Orbit Place of the Moon; then is EZ, the Distance of the Zenith from the Pole of the Moon's Orb, equal to the Altitude of the Nonagesime Degree in the Moon's Orb $20^{\circ} 32' 22''$; $\textcircled{D}E$ is always known to be 90° , the distance of the Moon from the Pole of her Orbit; and the Angle $\textcircled{D}EZ$ being the difference between the Moon's Orbit Place, and the Place of the Nonagesime Degree in the Moon's Orb equal to $19^{\circ} 16' 52''$, to find $\textcircled{ZD}$, the Complement of the Moon's true Altitude.

Let fall the Perpendicular DZ, and then say,

	$^{\circ}$	$'$	$''$	
As C. $\textcircled{Z}E$ Alt. Nonag.	20	32	22	10.426351
To Radius	90	00	00	10.000000
So C.S. $\angle \textcircled{D}EZ$ Diff. Lon.	19	16	52	9.974931
To $\textcircled{D}E$, the 4th Arch	19	28	35	9.548580
From $\textcircled{D}E$	90	00	00	always the same
Rem. $\textcircled{D}D$, the 5th Arch	70	31	25	

As C.S. 4th Arch = DE	19 28 35	Co Ar. 0.025589
To C.S. 5th Arch = D	70 31 25	9.522989
So C.S. EZ Alt. Nonag.	20 32 22	9.971475
To S. O, the true Alt.	19 20 23	9.520053

7. For the Parallaxic Angle = H O in the Moon's Orb.

As Radius	90 00 00	10.000000
To S. O her true Altitude	19 20 23	9.545274
So C.S. H, Moon from Descend.	70 43 8	9.543851
To C.S. H O, the Parall. Angle	82 56 51	9.089125

8. For the Moon's Horizontal Parallax.

1. For the Moon's Eccentricity.

As S. Equation Apogee	6 00 49	Co Ar. 0.979785
To the constant Number	11731	4.069354
So S. double Annual Argum.	35 28 22	9.763664
To the Moon's Eccentricity	64983	4.812803

But more Correctly thus: Supposing the Logarithm of the mean Distance of the Moon from the Earth to be 10.0000000.

R U L E.

To the Excess of the Co Secant of the second Equation of the Apogee above the Radius, add the Sine of the Double of the Annual Argument, and the Constant Logarithm 8.0691869, and you will have the Logarithm of the Moon's true Eccentricity at that time.

OPE.

O P E R A T I O N.

Second Equation of Apog.	6 0 49	Co Sec.	.9797851
Double Annual Arg.	35 28 22	Sine	9.7636646
Constant Logarithm	----		8.0691869
Logarithm of the Eccentricity,			8.8126367
Reject 4 from Characteristic, then	64958		4.8126367

2. For the Moon's Distance from the Earth.

As S. Elliptic Equation	3 22 25	Co Co Ar.	1.230479
To double Eccentricity	129966		5.113829
So S. $\angle$ at upper Focus	29 6 8		9.686966
To Dist. Moon from the $\odot$	1074173		6.031074

But more correctly, thus, supposing the Logarithm of the mean Distance of the Moon from $\odot$ to be 10.0000000.

R U L E.

Take the Sum and Difference between the true *Anomaly* and *Angle* of the Upper Focus; and also the half of Sum and Difference.

Then to the Sine of the *Angle* at the Upper Focus, add the Excess of the Co Secant above the Radius of the half Sum, and the Secant of the Radius of the half Difference: The Sum of these three shall be the true Logarithm of the Distance of the Moon from the Earth.

Example to the time above.

OPERA.

O P E R A T I O N.

	S. ° ' "	
True Anomaly	11 4 19 22	
Angle at Upper Focus	11 0 53 52	Sine 9.6871325
Sum	10 5 13 14	
Half	5 2 36 37	Co Sec. .3362300
Difference	0 3 25 30	
Half	0 1 42 45	Sec. .0001940
Logar. of Moon's Distance from the Moon		10.0235565

3. For the Moon's Horizontal Parallax in the Syzygia.

Now because Sir *Isaac Newton* makes the mean Horizontal Parallax of the Moon in the Syzygias $57' 30''$, and in the Quadratures $59' 40''$, the difference being $2' 10'' = 130''$, therefore we must find what it will be to the Distance of the Moon from the Sun at any particular time, thus, in the Example above the distance of the Moon from the Sun is $4^s. 229' 6' 37''$.

Now say,

As Radius	—	90 00 00	10.000000
To whole diff. of σ , δ , and $\square$		130"	2.113943
So S. Dist. $\curvearrowright$ à $\odot$		37 53 23	9.788270
To the 4th proportional Number		79.8	1.902213

Then, if the Distance of the Moon from the Sun

be $\{ 0, 1, 2, 6, 7, 8 \text{ Signs, add to } 57' 30'' \}$ the Sum or $\{ 3, 4, 5, 9, 10, 11 \text{ Signs, sub. from } 59' 40'' \}$ Difference is the Parallax, according to the Distance of the Moon from the Sun at that time; so in the Example above, the proportional Number $1' 19''.8$ is to be subtracted from $59' 40''$, there remains $58' 20''$.

Now for the Horizontal Parallax of the Moon, say,

As

As present Dist. of Δ to $\odot$	—	10.0235563
To the Mean	—	10.0000000
So S. Horiz. Parall. of Dist. Δ to $\odot$ $58^{\circ} 20'$		8.2296079
To S. true Horizontal Parallax	55 15	8.2060514

9. For the Parallax of the Moon in Altitude.

As Radius	—	90 00 00	10.0000000
To C.S. Moon's Altitude		19 20 23	9.974775
So S. Horizontal Parallax		0 55 15	8.206026
To S. Parall. in Altitude L		0 52 01	8.180801

10. For the Moon's Parallax in Longitude.

As Radius	—	90 00 00	10.0000000
To C.S. Parallax Angle		82 56 51	9.089123
So S. Parallax in Altitude		00 52 01	8.179901
To S. Parallax in Longitude		00 06 24	7.269024

11. For the Parallax in Latitude.

As Radius	—	90 00 00	10.0000000
To S. Parallax in Altitude		00 52 01	8.179851
So S. Parallax Angle		82 56 51	9.996701
To S. Parallax in Latitude		00 51 38	8.176552

12. To find the Parallax in Longitude by the Log. Logar.

OPERATION.

Horiz. Parallax of the Moon	00 55 15	LL 2.964181
Alt. Nonagesim. Deg. in Δ Orb	20 32 22	S. 9.545124
Dist. Moon from Nonag. Degr.	19 16 52	S. 9.518781
Parallax Longit. of the Moon	00 06 24	LL 9.028086

13 To find the Parallax in Latitude by the Log. Logarithms.

O P E R A T I O N.

Horizontal Parallax of the Moon 00 55 15 LL 9.964181
 Alt. of Nonag. Degr in $\angle$ Orb 20 32 22 C.S. 9.971475
 Parall. in Latitude of the Moon 00 51 44 LL 9.933656

N. B Because of the Smallness of the Triangle C $\angle$ L in Page 152, the Sides may be reduced into Seconds, and so resolved as a plain Triangle.

And because the Moon is in the Occidental Quadrant, the Parallax in Longitude must be subtracted; see my *System* Page 179.

Moon's true Ecliptic Place. $\approx$	25 13 36
Parallax in Longitude sub.	6 24
Moon's visible Longitude $\approx$	25 07 12
Moon's true Latitude South	2 21 6
Parallax in Latitude add	51 38
Moon's Visible Latitude South	3 13 07
Moon's true Altitude	20 12 48
Parallax in Altitude sub.	00 52 01
Moon's visible Altitude	19 20 47
Refraction add	2 38
Moons Altitude corrected	19 23 45

By what goes before, it is plain, that the Parallaxes and Refractions are of a contrary kind, viz. where the one is added, the other is subtracted, & *contra*; see my *System*, Page 177.

Note, When the *Sun* and *Moon* are not conjoined, as in the Example above, then you must find the Parallaxes of the *Moon*, and not of the *Moon* from the *Sun*, as is done in the next Example.

In the Triangle $\angle$ EZ, a certain Author advises to find the Angle E $\angle$ Z, and that shall be the Complement of the Parallaetic Angle: But this never holds true, but when the

the Moon is at her greatest Limit of Latitude, or 90 Degrees distant from her Nodes: For then doth the Circle of Longitude EJ fall at right Angles upon the Moon's Orb, and never else; so that at other times you must find the parallactic Angle, as I have shewn above.

Also, if you would find the Parallaxes by the Table of the Parallaxes hereunto annexed, you must enter with the Altitude of the Nonagesime Degree, and its Complement in the Moon's Orb, and not in the Ecliptic; for when the Moon has South Latitude (as in the Example above) the Altitude of the Nonagesime Degree in the Moon's Orb is less than it is in the Ecliptic; but when the Moon has North Latitude, then 'tis more.

14. For the Moon's apparent Diameter at the same time.

Here are three things to be considered.

1. In respect of the Horizon.

2. In respect of the Moon's Altitude.

3. In respect of the Moon's distance from the Earth.

For Sir Isaac Newton has determined the Horizontal Semidiameter in the Syzигias $15' 45''$, and in the Quadratures $15' 31'' \frac{1}{2}$; therefore we must first find what the Horizontal Semidiameter will be, in respect of the Distance of the Sun and Moon at any given time, it will always hold.

As Radius	90 00 00	10.000000
To the Diff. of Semid. in $\odot$, δ , and $\square$	13.5	1.130354
So Si Distance γ a $\odot$	37 53 23	9.788270
To the 4th proportional Part	8.3	0.918604

Now observe, if the Distance of the γ from the $\odot$ be $\{ 0, 1, 2, 6, 7, 8 \}$ Signs, sub. from $15' 45''$ the Sum or $\{ 3, 4, 5, 9, 10, 11 \}$ add to $15' 31'' \frac{1}{2}$ Difference is the Horizontal Semidiameter in respect of the Distance of the Sun and Moon at the given time.

So

So in the Example before us, the Fourth proportional Number $8''.3$ is to be added to $15' 31''.5$, and the Sum $15' 39''.8$ is the Moon's Horizontal apparent *Semidiameter*, according to the Distance of the Moon from the Sun $4^s 22^o 6' 37''$.

In the 34th Page of my *System of the Planets demonstrated*, I have proved, that the Heavenly Bodies are nearer the Observer when on the Meridian, than when in the Horizon, by near the Earth's *Semidiameter* : Whence it is manifest, that the Apparent Diameters of the Planets are least in the Horizon, and greatest in the Zenith ; and are to each other at those respective Distances, as the Sines of those respective Distances from the Zenith.

For this purpose I have annexed the following Table, which enter with the Moon's Altitude $19^o 20' 23''$; and because she is nearer the Apogee than the Perigee I take out the Augmentation of her Diameter $10''$, therefore the Moon's apparent *Semidiameter* in respect to her Altitude is $15' 44''$.

Lastly, For the true apparent *Semidiameter* of the Moon in respect of her present Distance from the Earth.

As the Horiz. Parall. of Dist.	☾ à ☉ $58\ 20$	Co Ar.	878
To present Horizontal Parallax	$55\ 15$		358
So Apparent Semid. Altitude	$15\ 45$		5810
To true Apparent Semidiameter	$14\ 55$		6046

The Table is thus made :

The Moon's Zenith Diameter exceeds her Horizontal in Perigee $36''$. I would know, how much her Horizontal Diameter must be encreased at the Altitudes of 30 and 60 Degrees severally ?

To Augment the Horizontal Diameter.

Alt. ☉ and ☽ °	The ☽'s Apog. "	The ☽'s Perig. "	☉'s Pa- rallax. "
0	0	0	10
2	1	1	10
4	2	2	10
6	3	4	10
8	4	5	10
10	5	6	10
12	6	7	10
14	7	9	10
16	8	10	10
18	9	11	10
20	10	12	10
22	11	13	10
24	12	15	9
26	12	16	9
28	13	17	9
30	14	18	9
32	15	19	8
34	16	20	8
36	17	21	8
39	18	23	8
42	19	24	7
45	20	25	7
48	21	27	7
51	22	28	6
54	23	29	6
57	23	30	6
60	24	31	5
63	25	32	5
66	26	33	4
69	26	34	4
72	27	34	3
75	27	35	3
78	28	35	2
81	28	35	2
84	28	36	1
87	28	36	1
90	29	36	0

Again

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So S. n
To S. C

The
because
Eclipse

OPERATIONS.

As Radius	—	—	90 0	10.000000
To Diff. of Horiz. and Zenith Diameters			36''	1.556302
So S. Altitude ☾			30 0	9.698970
To the Quant. to be added to Horiz. Diam.			18	1.255272

Again,

As Radius	—	—	90 00	10.000000
To Diff. of Horiz. and Zen. Diam.			36	1.556302
So S. Alt. ☾	—	—	60 00	9.937531
To Quant. to be add. to Horiz. Diam.			31	1.493833

And after this manner is the Table calculared ; in which is also given, the *Sun's* Parallax answering to the Altitude.

15. Find the Greatest and Least Horizontal Parallax of the Moon in the *Syzygia*.

1. For the Least.

As the Greatest Distance of ☾ à ☉			6.0280736
To the mean Distance			6.0000000
So mean Hor. Parallax in the <i>Syzygia</i>	57° 30'		8.2233523
To S. Least Horizontal Parallax	53 54		8.1952787

2. For the Greatest.

As the Perigeon Distance of ☾ à ☉			5.9700320
To the mean Distance			6.0000000
So S. mean Horizontal Parallax	57' 30"		8.2233573
To S. Greatest Horizontal Parallax	61 36		8.2533253

The Table in Page 110, differs a small matter from this ; because that Table is made to serve as well for the Moon's Eclipse as the Sun's.

16. To find the Moon's Greatest and Least Apparent Semidiameter in the *Syzigia*.

1. For the Least.

As mean Horiz. Parallax in the <i>Syzigia</i>	57 30 LL	Co Ar.	815
To the mean Semidiameter	15 45		5809
So Apogee Horiz. Parallax	53 54		466
To least apparent Semidiameter	14 46		6090

2. For the Greatest.

As the mean Horizontal Parallax	57 30 LL		185
To the mean Semidiameter	15 45		5809
So Perigee Horizontal Parallax	61 36		114
		Z	199
To Greatest apparent Semidiameter	16 52		5510

Example 2. Let the Visible Place of the Moon be sought at the time of the Visible Conjunction of the Sun and Moon *Anno 1737, February 18, 3 h. 4' 22"* at *London*. See the Synopsis, and mark it well.

	d.	h.	'	"
Given Apparent Time 1737, February	18	03	04	22
Equation of Time add			12	43
Equal Time	18	03	17	05
Moon's Orbit-Place	11	11	30	35
North Node	05	17	57	29
Argument of Latitude	05	23	33	06
True Latitude Moon North Desc.		00	35	33
Reduction add			01	33
Ecliptic Place	11	11	32	08
Sun's Place	11	11	08	44
Sun's Right Ascension	343	36	33	
Apparent Time from Noon add	46	05	30	
Sum is Right Ascension <i>Med. Calis</i>	28	42	03	
Angle Moon's Orbit with Equinoctial	18	54	08	
Angle Moon's Orbit with Ecliptic	05	16	29	

Di:

Distance in the Equator to be subtracted	07 16 40
Culminating Point in the Moon's Orb	00 02 30
Meridian Angle in the Moon's Orb	73 29 31
Right Ascension Med. Cæli Moon's Orb	21 25 23
Declination of the Culm. Point Moon's Orb	07 11 05
Altitude Mid-Heaven in the Moon's Orb	45 39 06
Alt. Nonagesime Degree in the Moon's Orb	46 43 57
Nonagesime Degree in the Moon's Orb	15 34 54
Descendant	15 34 54
Moon's Orbit-Place from the Descendant	25 55 41
Moon from the Nonagesime Degree	2 04 04 19
Moon's true Altitude	18 33 57
Parallactic Angle in the Moon's Orb	46 18 11
Second Equation of the Apogee	08 55 58
Annual Argument	11 02 08 10
Mean Anomaly of the ☾	11 09 02 48
Angle at the Upper Focus	11 09 00 19
Elliptic Equation	02 22 46
The Moon's Eccentricity 62435	Logar. 4795428
Distance of the Moon from the Earth	6.032457
Horizontal Parallax of ☾ à ☉	53 11
Moon's Parallax in Altitude from the Sun	50 25
in Longitude ☾ à ☉	34 35
in Latitude ☾ à ☉	36 27
Moon's apparent Semidiameter	14 57
Moon's true Ecliptic Place	11 11 52 8
Parallax Longitude sub.	34 50
Moon's Visible Ecliptic Place	11 10 57 18
Moons true Latitude North Descend.	35 33
Parallax of Latitude	36 27
Visible Latitude ☾ South	00 54
Moons true Altitude	18 33 57
Parallax in Altitude of the Moon subtract	00 50 35
Visible Altitude of the Moon	17 43 22
Refraction add	02 30
Visible Altitude of the Moon corrected	17 45 52

These Parallaxes may all be found in the Tables of Parallaxes, and by the Logistical Logarithms, exactly agreeing with what was found before by help of the *Parallactic Angle*, and *Parallax in Altitude*.

By which it appears, that when you have found the Altitude of the Nonagesime Degree in the Moon's Orb, and the Distance of the Moon from the Nonagesime Degree, that then you may find the Parallax in Longitude and Latitude by the Logistical Logarithms more speedily than by the *Parallactic Angle*.

This Method of mine, of finding the Nonagesime Degree in the Moons Orb, &c. was entirely unknown to the Antients, and consequently the Moons true Parallaxes were never truly found till now; as I have proved by many Examinations of the Works both of the antient and modern Astronomers.

They never knew a direct Method of taking the Nonagesime Degree in the Moons Orb, for want of ascertaining the true Obliquity of her Orb with the Equinoctial and Ecliptic; a Problem as useful in this Science, as the Light of the Sun is to the Eyes.

CHAP. XIV.

Of the Moon's Mean Motion, and how the Anticipations of the New Moons may be found by the Epacts.

IN my *Astronomical Definitions*, Vol. I. of my *System*, I have given, under the Word *ÆRA*, such Periods of Time, as are most used in the known World: And because it is by the Sun's (apparent) Motion that we measure Time, I shall make it my business in this Chapter to shew, how the true and mean Tropical Years are found, with their just Lengths; which from my *Astronomical Tables* stand thus:

	d.	h.	'	"
Sun enters <i>Aries</i> { 1733 } March { 9 2 9 35	9	2	9	35
{ 1734 }	9	7	58	37

True Length of the Tropical Year 365 5 49 2

The Operations of the mean Times stand thus:

S.	°	'	"	'''	S.	°	'	"	'''
1733	9	20	58	21 00	1734	9	20	44	1 0 0
Mar. 11	2	8	59	42 00	Mar. 11	2	8	59	42 0 0
0 h. 47'			1	55 49	6			14	47 0 0
29"				1 11	36			1	28 43 0
☉ in γ	0	0	00	00 00	31			1	56 23
					15				37
					☉ in γ	0	0	0	0 0 0

M 3

From

By this it appears, that the mean Time between one Conjunction and another of the Sun and Moon, is 29 Days, 12 hours, 44 min. 6 sec. which multiplied by 12 Months, gives 354 days, 8 hours, 49 min. 12 sec. for the Length of the Lunar Year; which taken from the Solar Year, 365 days, 5 hours, 49 min. 2 sec. 15", leaves 10 days, 20 hours, 39 min. 30 sec. 15" for the Epact.

Or, the same may be found, by adding the time of the Lunation, 29 days, 12 hours, 44 min 6 sec. to it self 12 times; and then the Day of the Month that each Lunation ends upon, may be found by the Table of Days in my *Satellite Astronomy*, Page 94, as appears more at large by the Work.

Month	D.	h.	m.	s.	
1	29	12	44	6	January 29.
2	59	1	28	12	February 28.
3	88	14	12	18	March 29
4	118	2	56	24	April 28.
5	147	15	40	30	May 27.
6	177	4	24	36	June 26.
7	206	17	08	42	July 25.
8	236	5	52	48	Aug. 24.
9	265	18	36	54	Sept. 22.
10	295	7	21	00	Octob. 22.
11	324	20	5	6	Novemb. 20.
12	354	8	49	12	Decemb. 20. Moon's Year.
	365	5	49	2	15 Sun's Year.
X	10	20	59	50	15 Epact.

But to avoid Fractions in Practice, the Epact is called 11; which, you see, is too much by 3 hours, 0 minutes, 9 seconds, 45".

Further, if you observe the Days of the Month of each Lunation in the Table above, wants just 10 much of 30, as is the Number of Months that we add to the Epact to find the Moon's Age, or Day of Change, as *Street* in his Verses has it, viz.

Jan. 0, 2, 1, 2, 3, 4, 5, 6,

7, 8, 10, 10, these to the Epact fix, &c.

M 4

Jan.

Now, if the Length of the Solar Year 365 Days, 5 hours, 49 min. 2 sec. 15^m be divided by the mean Time of one Lunation, 29 Days, 12 hours, 44 min. 6 sec. the Quotient $12 \frac{11117144}{11117144} = 12 \frac{11117144}{11117144}$ are the Number of Lunations in one Solar Year complet.

Or, divide the Circumference of the whole Zodiac, 360, by 29 Days, 6 min. 25 sec. the mean motion of the Sun in one Lunation, the Quotient $12 \frac{11117144}{11117144}$, nearly the same as before are the Lunations in one Solar Year; which is in its lowest Term $12 \frac{11117144}{11117144}$.

Also, if the Length of the Solar Year, 365 days, 5 hours, 49 min. 2 sec. 15^m be divided by 27 days, 7 hours, 43 min. 7 sec. the D's periodical Month, the Quotient $13 \frac{11117144}{11117144}$ are the Number of Revolutions in a Solar Year Complet.

Lastly, If we divide 19 Julian Years by the time of one mean Lunation 29 days, 12 hours, 44 min. 6 sec. we shall have $235 \frac{11117144}{11117144}$, or in its lowest Term, $235 \frac{11117144}{11117144}$, which are the Lunations that happen in 19 Julian Years; and 19 Julian Years are equal to 6939 days, 18 hours.

OPERATION.

d. h.

365 6

24

1466

730

8766 Hours.

19 Years.

38894

8566

34)166554(6939 d. 18 h.

Then

Then, to find in what time 235 Lunations are made, allowing the time of one Lunation to be 29 d. 12 h. 44' 6", the Work stands thus :

If 1 : 29 d. 12 h. 44' 6" :: 235 ?

There doth come out 6939 Days, 16 hours, 43 min. 30 sec. which are less than 19 *Julian* Years by 1 hour, 16 min. 30⁰⁰ seconds. For,

	d.	h.	"
19 <i>Julian</i> Years are	6939	18	00 00
235 Lunations are performed in	6939	16	43 30
Difference		1	16 30

And consequently, the New Moons after 19 *Julian* Years will not return to the same Hour of the Day ; but will happen 1 hour, 16 min. 30 sec. sooner ; which in the space of 357 $\frac{2}{3}$ Years will amount to one intire Day, as appears by this Work :

d. ' " Y. h. Y.
If 1 16 30 : 19 :: 24 257 $\frac{2}{3}$ = 1 ?

But, according to some Authors, it will be but 310 $\frac{2}{3}$ Years ; because they make the Length of the Lunar Synodical Month consist but of 29 days, 12 hours, 44 minutes, 3 seconds ; therefore 235 Lunations are made in 6939 days, 16 hours, 31 min. 45 sec. which are less than 19 *Julian* Years by 1 hour, 28 minutes, 15 seconds.

But *Kingsley*, in his Ephemeris for the Year 1712, makes it 6939 days, 16 hours, 32 min. 28 sec. 5^{'''} ; that is, 1 hour, 27 min. 31 sec. 55^{'''} sooner.

The Lunations return in 19 Years, which amounts to one Day in 312 $\frac{2}{3}$ Years, nearly agreeing with *John Newton* in his *Cosmography*, Page 375.

See *Keil's Astronomical Lectures*, where he makes it but 304 Years that the Lunation will make up to compleat one whole Day.

Now

Now, how these Authors make the time of the mean Lunation to be only 29 days, 12 hours, 44 minutes, 9 seconds, they do not any where inform us : This is shorter than what I make it, by 3 Seconds. This difference may seem inconsiderable ; yet in process of time it will make a considerable Error.

And now, because the New Moons do not return at the End of 19 Years, exactly at the same time of the Day, but 1 hour, 16 minutes 30 seconds sooner than they did 19 Years before ; and that in 357 Years they will anticipate one Day ; which proves that the Epact it self varies 1 in every 357 Years ; that is, for every 357 Years past, one Day is to be subtracted ; and for every 357 Years to come, the Epact is to be increased by 1 ; that is, when you have found the Epact in the *Julian* Account, according to the common method, for every 357 Years, from the Year of the *Nicene* Council 322 (some say, it was in the Year 325, *Booker* says, it was in 326,) you are to add 1 to the *Julian* Epact : And from the *Roman* Epact subtract so many Days from the *English* Epact, as are the difference between the two Accounts in that Century.

As, for Example ; in the Year 1734, the *English* Epact is 6 ; from which take 11, the difference between the *Julian* and the *Gregorian* Epact (by borrowing 30) there remains 25, for the *Gregorian* Epact.

At the *Nicene* Council they placed the Golden Number right against the Day of the Month in the *Kalendar*, on which the Moon Changed, and so was of good use to find the Day of the New Moon, and also the Feast of *Easter* ; but for the reasons above given, (concerning the Epact) the former of these is become wide of all Truth : The present Age has gained no less than Four whole Days, since the *Nicene* Council ; that is, the Moon that Changed on the 29th Day of *December* then, will in this Age Change on the 25th Day of the same Month.

As, for Instance ; I find a Number of Years between 1734 and the time of the *Nicene* Council, that being divided by 19, leaves for the Remainder, nothing ; which Number of Years are 1406 ; which taken from 1734, leaves 328 ; in which

which said Years, viz. 328, and 1734, the Golden Number is 6; and in that Interval of Years there are Seventy four Revolutions of the Golden Number, and (near) Four of the Epact. By which I prove, that the Epact must be less in the Year 328, by 4, than it is in the present Year 1734, as appears more plain from the following Table, wherein I have placed the Years of the Nicene Council, and the Years of the present Age together, with the Golden Number to those Years, and also the Epacts answering each, severally; whose Difference of the Epacts, you see, are Four.

Epact 25	7	18	29	10
322	323	324	325	326
1728	1729	1730	1731	1732
Epact 29	11	22	3	14
Epact 21	327	328	329	330
1733	1734	1735	1736	1737
Epact 25	6	17	28	9

From this Table, it is plain, that if you take the Epact for any Year about the time of the Nicene Council, as suppose 322, the Epact was then 25; and add to it for the Month of December (according to Page 167) this Sum 25, taken from 60, leaves 25 for the Day of the New Moon; over-against which Day, in the Kalendar of our Common Prayer Book, you will find the Golden Number 19 placed, and so they placed the Golden Number over-against the Day in every Month on which the Moon Changed.

If

If therefore you place the 19 Golden Numbers, or Primes, right against the Day in each Month, on which the Moon Changeth, you will have a Table of the Days of the New Moons in this Age, and will serve for near 357 Years to come.

That my young Astronomical Reader may be furnished with every thing for his purpose (with things) of this kind, I shall here insert the Calculations of the Sun's Ingress into the Equinoctial Sign *Aries* in the Year of Christ 322, it being the first Year of the *Nicene Council*, and is, from my Tables, as follows.

Equal Time at <i>London</i> .		Longit. ☉				Anom. ☉			
		S.	°	'	"	S.	°	'	"
Radix	301	9	10	9	10	6	26	54	40
Years	20	0	0	9	4	11	29	48	4
	1	11	29	45	40	11	29	44	37
March	20	2	17	51	58	2	17	51	45
Hours	4			9	51			9	51
Minutes	55			2	16			2	16
Seconds	35								
Mean Mot.		11	28	8	0	9	14	31	14
Equat. add			1	52	0				
Sun in <i>Aries</i>		0	0	0	0				

But

But the mean Time of the Vernal Equinox happens thus :

Equal Time		Longitude Sun.			
		S.	°	'	"
Radix	301	9	10	09	10
Years	20	00	00	09	04
Year	1	11	29	45	40
March	22	2	19	50	14
Hours	2			04	56
Minutes	22				54
Seconds	37				2
Sun in <i>Aries</i> .		00	00	00	00

At the beginning of this Chapter I told you, that the Sun enter'd *Aries* this Year 1734, *March* the 9th day, 7 hours, 58 min. 37 sec. under the Meridian of *London*; which is sooner than it did at the time of the *Nicene* Council by 10 days, 20 hours, 56 min. 58 sec. (not regarding the Difference of Meridians in this Case.)

The *Julian* Year, 365 days, 6 hours, exceeds the Tropical Year 365 days, 5 hours, 49 min. 2 sec. 15^u, by 10 min. 57 sec. 45^u; therefore to know in what time this will amount to a whole Day, say thus :

If 10' 57" 45^u : 1 Year :: 24 h. : 131 Y. $\frac{1348}{131}$; equal to 131 $\frac{3817}{783}$ Years ?

Here you see, that in 1412 Years the time of the Vernal Equinox has gone back 10 days, 20 hours, 56 min. 58 sec. so that if the *Julian* Year goes on thus, without any Correction, in Process of time the Sun will come to enter *Aries* on *Christmas* Day : And to know how many Years it will be ere it come to be so, is made manifest from this Work :

Dec. 6
Jan. 31
Feb. 28
Mar. 9
D.
If 1 : 141.35692 :
74 Days.

5254276	Radic
91942.83	Years
9720.4106	Years
1734 add	Months
	Hours
	Minutes

Year of Christ 11454 when the Sun will enter *Aries* upon
Christmas-Day.

How strangely will the Seasons of the Year be alter'd, to what they are now, if any Person were to be alive to see it! But if the World endure so long, the People then living will not know any Alteration; because this Alteration is made gradually, and by little and little; so that in an Age the Vulgar cannot perceive it.

If we examine this Time by the morions of the Sun and Moon, we shall find it too short: However, this will serve our purpose well enough.

Booker, in his *Tractatus Paschalis*, Page 5, tells us, that the Christian Church have been always studious and solicitous, as, not only the Bishops, but the Oecumenical or General Councils have diligently prescribed what time, and Day of the Year, with what Rite, and Ceremonies the Holy Feast of *Easter* should be Celebrated; that all Controversies which happen'd concerning the same in the Primitive Times, might be removed and taken away: Which was accomplished by the First General Council at *Nice*, in the Year after Christ 326; the Canons, or Rules of which Council were,

First, That the Equinoctial Day should be observed upon the 21st Day of *March*.

Secondly,

Secondly, That the *Full Moon* happening upon the 21st Day of *March*, or the next Day after, should be counted the *Full Moon* of the Month *Nisan* (which is part of our *March* and *April*.)

Thirdly, That the *Sunday* which next followed that succeeding *Full Moon*, should be *Easter-Day*; but if the 14th Day of the *Moon* should happen to be on the *Sunday*, then the next *Sunday* should be *Easter-Day*.

And this is the Decree of the said Council of *Nice*; for which there are these Reasons:

First, That there might be some Analogy, or Correspondency between the *Jewish* and Christian *Pascha*, or *Easter*; but so, that the *Jewish* Solemnity might at no time concur with the Christian Memorial of the Resurrection of Christ.

Secondly, That at no time an Eclipse of the Sun should be seen at the Feast of *Easter*, as that, which was miraculous, at the Death of Christ, and, contrary to the Course of Nature, happening at the *Full Moon*, lest it might give occasion to the *Jews* and Infidels to calumniate the Christians.

Now, because our *Easter* can never fall lower than the Twenty second Day of *March*, nor higher than the Twenty fifth Day of *April*, I will here subjoin a Table of its Limit, answering one Cycle of the *Moon*.

A TABLE

A TABLE of Easter-Limit.

G.N.	Limit.	G.N.	Limit.
1	April 5	11	April 15
2	March 25	12	April 4
3	April 13	13	March 24
4	April 2	14	April 12
5	March 22	15	April 1
6	April 10	16	March 21
7	March 30	17	April 9
8	April 18	18	March 29
9	April 7	19	April 17
10	March 27		

The Use is, Having found the Golden Number for the Year, right against it in this Table is *Easter-Limit* that same Year; and the next Sunday following this Limit is *Easter-Day* in the *Julian Account*. So this Year 1734, the Golden Number is 6; against which is *April 10, Easter-Limit*; the next Sunday after is *April 14, Easter-Day*, &c.

In the above Discourse, where I have mentioned, that at the General Council they established the Rule for finding the Holy Feast of *Easter*; the *Full Moon* there mentioned is not the true time of the ☉ and ☾'s Opposition in an Astronomical Sense; but the Day only of the ☾'s mean Opposition, which is called the *Ecclesiastical Full Moon*, as is expressed in our Common Prayer-Book; according to which Rule I have framed this following Table, which, by the help of the Golden Number, and *Roman Dominical Letter*, gives the *Roman Easter*. In which Table, all those Days with no Name to them are in *April*.

A TABLE to find the Roman Easter.

G.	A	B	C	D	E	F	G
1	April 16	Apr. 17	Apr. 18	Apr. 19	Apr. 20	Apr. 14	Apr. 15
2	9	3	4	5	6	7	8
3	Mar. 26	Mar. 27	Mar. 28	Mar. 29	Mar. 30	Mar. 31	Mar. 25
4	April 16	Apr. 17	Apr. 11	Apr. 12	Apr. 13	Apr. 14	Apr. 15
5	2	3	4	5	6	Mar. 31	1
6	23	24	25	19	20	Apr. 21	22
7	9	10	11	12	13	14	15
8	2	3	Mar. 28	Mar. 29	Mar. 30	Mar. 31	1
9	16	17	Apr. 18	Apr. 19	Apr. 20	Apr. 21	22
10	9	10	11	12	6	7	8
11	Mar. 26	Mar. 27	Mar. 28	Mar. 29	Mar. 30	Mar. 31	1
12	April 16	17	Apr. 18	Apr. 19	Apr. 13	Apr. 14	15
13	2	3	4	5	6	7	8
14	Mar. 26	Mar. 27	Mar. 28	Mar. 22	Mar. 23	Mar. 24	Mar. 25
15	April 16	Apr. 10	Apr. 11	Apr. 12	Apr. 13	Apr. 14	15
16	2	3	4	5	6	7	1
17	23	Mar. 14	18	19	20	21	22
18	9	Apr. 10	11	12	13	7	8
19	2	Mar. 27	Mar. 28	Mar. 29	Mar. 30	Mar. 31	1

Note, $7 \times 19 = 133$, $\times 4 = 532$. That is, $4 \times 7 \times 19 = 532$
 $= 19 \times 28 = 532$, the Revolution of *Easter* in both Accounts.

CHAP.

CHAP. XV.

To find by Calculation the Latitudes and Longitudes of all those Places on the Globe, where the principal Appearances of Solar Eclipses are seen.

TO give an Account of the chief *Phænomena* of a Solar Eclipse, and to describe the Places on the Earth, where they will happen, whilst the Shadow of the Moon goes along with the Earth,

Let $H \odot B M$ represent the Globe of the Earth revolving from West to East by its Diurnal motion upon the Axis $P \odot \odot$, P being the North Pole; but the South Pole lieth hid, being turned as much from $\odot$ on the other side from us, as P is on this side towards us.

Let the Hemisphere of this Globe, seen in the Scheme, be that which is enlighten'd by the Sun; therefore the Sun will directly and perpendicularly shine on the Circle $H \odot B M$, whose Pole is $\odot$.

And this may be truly proved, and represented by an artificial Globe, thus:

Mark the Sun's Place in the Ecliptic, and move the Meridian in the Horizon till the Sun's Place be in the Zenith. Here stay it.

Now all those Places that are above the Horizon are enlighten'd, and those under the Horizon are in Darknes.

The upper Part of the Globe is here represented by the Circle $H \odot O B$, which in Projections of this nature is called the *Horizon of the Earth's enlighten'd Disk*. And the Bigness of this Disk is to be estimated by the Angle under which the Earth is seen from the Moon, and is of the same Quantity with her Horizontal Parallax. And $P \odot \odot$ is the Axis of the Globe. It is certain, that it is Noon at every Place of the Earth, when the Earth comes to that half of the Circle $P \odot \odot$, which is here visible; because the Sun is in the Plane of it.

A I represents the Way of the Center of the Moon's Penumbra, describing the Tract B f H, on the Surface of the Earth. Tho' the Hemisphere of the Earth, which is enlighten'd by the Sun, and consequently has Day, be supposed to be rais'd up above the Surface of the Scheme; yet the Way A I is conceived to be gone thro' by the Center of the Penumbra, on the Plane of the Disk, upon which the said Hemisphere stands.

Moreover, tho' P ⊙ ⊙, L ⊙ Q (the Ecliptic) and N e ⊙, be Circles in the said enlighten'd Hemisphere, crossing one another in ⊙, the Point directly under the Sun, they all represent the right Lines upon the Disk of the Earth, directly under these Circles, viz. those which are the Orthographical Projection of those Circles, when the Eye is supposed in a distant Point of the Right Line which joyns the Centers of the Earth and Sun.

It is plain, that when the Center of the Moon's Penumbra is come to A (namely, when the penumbrous Circle touches the Earth's Disk at O) the Eclipse of the Sun will begin to an Inhabitant at O. Now he that is at O, by the Diurnal Revolution of the Earth begins to enter the enlighten'd Hemisphere; that is, the Sun rises to him.

Therefore to the Inhabitant of the Earth at O, whom, first of any Inhabitant of the Earth the Penumbra reaches, the rising Sun will first of all appear to be Eclipsed in its upper or Western Limb.

When the Center of the Penumbra itself comes to the Earth at B, an Inhabitant there sees the Rising Sun totally Eclipsed; because he is under the Center of the Penumbra; that is, if the Semidiameter of the Moon exceed that of the Sun: But if it doth not, it will be a Central Eclipse, and consequently Annular to him.

He that lives at C, sees the Sun Centrally Eclipsed in the Meridian.

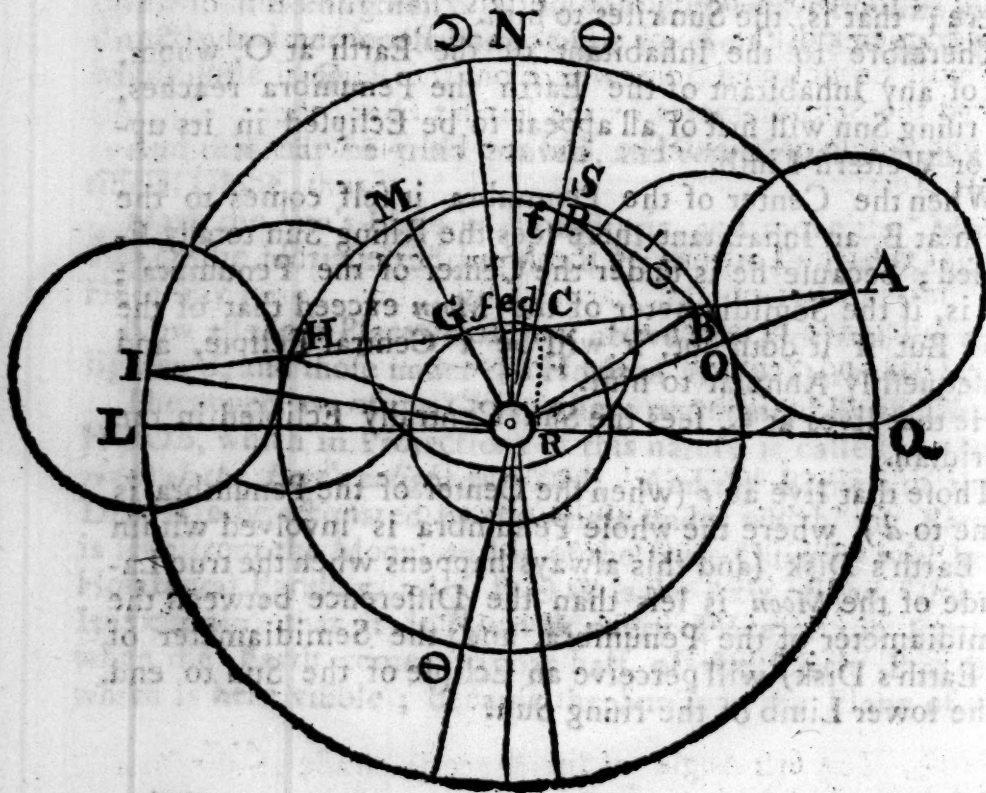
Those that live at z (when the Center of the Penumbra is come to d) where the whole Penumbra is involved within the Earth's Disk (and this always happens when the true Latitude of the Moon is less than the Difference between the Semidiameter of the Penumbra, and the Semidiameter of the Earth's Disk) will perceive an Eclipse of the Sun to end at the lower Limb of the rising Sun.

When the Center of the Penumbra comes to *e*, the Axis of the Ecliptic, the Sun will be Centrally Eclipsed in the the Nonagesime Degree; and *f*, the Axis of the Moon's Way, is the middle of the Universal Eclipse.

When the Center of the Penumbra comes to *G*, the Inhabitants of the Earth at *M* will perceive the Eclipse of the Sun to begin, as the Sun sets: For here the Penumbra doth last of all touch the Disk, as it is ready to go out of it.

And when the Penumbra is come to *H*, the End of the Disk, the Spectator, which at that time is at that Point, sees the setting Sun (because being ready to change Day for Night, he goes out of the enlighten'd into the darken'd Hemisphere) Centrally Eclipsed.

And Lastly, He that, being at *I*, receives the last stroke of the Moon's Penumbra, sees the setting Sun as it were contiguous to the Moon in its upper Limb, and the End of the Eclipse, both universal and particular every where.



Thin
by the

In my *Compleat System of Astronomy*, I have shewed how to Calculate the Times and Quantities of a Solar Eclipse, both for any particular Place on the Globe, and also the time of the General Eclipse, shewing there the time the Penumbra takes up in its Passage over the Earth's Disk; but the Latitudes and Longitudes where those Appearances happen, I have purposely omitted, then intending to give a particular Tract by it self; which I shall here do in the following manner.

And first of all, you must carefully observe these following Preliminaries.

First, By the 17th Precept of my *Compleat System of Astronomy*, you must Calculate the Times of the General Eclipse for the Meridian of *London*, and delineate the Scheme, to shew the Passage of the Penumbra over the Earth's Disk during the time of the proposed Eclipse, that so you may have all the Requisites in readiness, as you will have occasion for them in your following Work.

Secondly, If the true Latitude of the *Moon* at the equal Time of the true Conjunction be less than the Sum of the Semidiameter of the Earth's Disk and Penumbra, the Sun then will be Eclipsed somewhere on the Earth: But if it exceed the Semidiameter of the Earth's Disk, there will be but one Angle of Incidence, and the Eclipse will not be any where Total.

1. If the true Latitude of the *Moon* be less than the Semidiameter of the Earth's Disk, but more than the difference between the Semidiameters of the Earth's Disk and Penumbra, the Eclipse will then be Central, and there will be two Angles of Incidence.

3. If the true Latitude of the *Moon* be less than the difference between the Semidiameters of the Earth's Disk and Penumbra, there will be three Angles of Incidence, and the Eclipse will be Total, if the Diameter of the *Moon* exceed the Semidiameter of the *Sun*, other ways Annular.

Thirdly, The first Angle of Incidence is made at the *Sun* by the Axis of the *Moon's* Orb, and by a Line drawn from thence

thence to meet the Moon's Orb in the Center of the Penumbra when it cuts the Circumference of the Circle, that is struck with the Sum of the Semidiameters of the Earth's Disk and Penumbra.

The second Angle of Incidence is made at the Sun, by the Axis of the Moon's Way or Orb, and by a Line drawn from the Sun to the Center of the Penumbra, when it cuts the Earth's Disk.

The third Angle of Incidence is made at the Sun, by the Axis of the Moon's Way, and by a Line drawn from the Sun to meet the Moon's Way in the Center of the Penumbra when it cuts the Perimeter of the Circle that is swept with the Difference of the Semidiameters of the Earth's Disk and Penumbra. And these are all the Varieties that can happen.

Fourthly, That the Angle Orient, or Altitude of the Nonagesime Degree in Projections for this purpose, is the Angle made by the Axis of the Ecliptic, and by a Line drawn from the Sun to any Point in the Earth's Disk, where the Center of the Penumbra touches it at any given time.

And this Angle may be found at all times, by adding or subtracting the Angle of the Moon's Way, to, or from the Angles of Incidences severally, as your own Reason will soon direct, better than a Multitude of Words: For if the Angle of the Moon's Way lie within the Angle of Incidence, then you must subtract; but if it lie without, you must add.

And by this Discovery which I have made in the *Keplerian* Method, you have not any occasion to find the Latitude of the Moon, except when the Center of the Penumbra is either in the Nonagesime Degree, or Centrally Eclipsed in the Meridian; and then make the Semidiameter of the Disk the Radius of a Line of Sines on the Sector; then will $\odot e$ in all the universal Schemes be the Co-Sine of the Altitude of the Nonagesime Degree or Angle Orient; and $\odot c$ the Co-Sines of the Angle Orient, when the Center of the Penumbra is upon the Earth's Axis; which two Analogies you will find in their proper places.

Fifthly, The Amplitude of the Path is always that Arch in the Horizon of the Disk between, where the Axis of the Globe cuts it, and where a Line drawn from the Sun to the Place where the Center of the Penumbra cuts it; which may be measured on the Chords, if you make the Semidiameter

meter of the Earth's Disk the Radius of the Chord of 60° upon the Sector. Where note,

Sixthly, If with the Altitude of the Nonagesime Degree, and the Cusp of the Ascendant, you enter the Table of the Angle Orient, where you find them to meet in the Table, is the Latitude of the Place North. But if you cannot find them throughout all the Table, then enter with the opposite Degree Ascending, and you will have the Latitude of the Place South. Except in the Polar Circles, where it is doubtful.

Seventhly, If the Time at London be less than it is at the Place sought, then the Place lies to the East of London; but if it be more at London than at the Place sought, then it lies to the West of the Meridian of London.

Eighthly, Observe in both methods for finding the Difference of Longitude, that you always subtract the Right Ascension of the *Medium Cæli* at London from the Right Ascension of the *Medium Cæli* at the Place you are seeking, and the Remainder is the Difference of Meridians in the *Keplerian* method. From the East, borrow a Circle, if you cannot subtract.

Also in the *Flamstedian* method, subtract the time of Sun-rising, &c. at London, from the time at the other Place, and the Remainder is the Difference of Meridians to the East of the Meridian of London; but if the Remainder exceed a Semicircle, or 180° , then deduct 180° from it, and the Remainder is the Longitude West of London.

To the Sun-rising always add 12 Hours, and to the time of Sun-setting borrow 24 Hours, if Subtraction cannot be made.

Ninthly, When you find the Latitude of the Place by the *Keplerian* method, the Angle Orient is found, as I have directed in the Fourth hereof, except when the Center of the Penumbra is upon the Earth's Axis; and then it must be done, as you will find in their proper Places.

But at any other time, If you would prove my Method of finding the Angle Orient, as shewn in the Fourth hereof; then when the Center of the Penumbra is at A or I, $\odot A = \odot I$ must be made Radius, by saying,

As the Sum of the Semidiameter of the Earth's Disk and
Penumbra $\equiv \odot A \equiv \odot I$,

Is to the Radius ;

So is the Moon's Latitude,

To the Co Sine of the Angle Orient, or Altitude of the
Nonagesime Degree.

When the Center of the Penumbra is at B or H, then $\odot B$
 $\equiv \odot H$ must be made Radius. And when the Center of
the Penumbra is at d or G (in Figure 1.) then $\odot d \equiv \odot G$
must be made Radius ; that is,

As the Difference between the Semidiameter of the Pe-
numbra and Earth's Disk,

Is to the Radius ;

So is the Moon's Latitude at d or G,

To the Co Sine of the Angle Orient at that Place.

Example. In the Sun's Eclipse, July the 4th, 1730,
in the Scheme, Page 180, the Angle $e \odot d = 3^{\circ} 29' =$
Angle Orient ; then suppose a Perpendicular let fall from d,
and it will be parallel to $\odot e$; therefore the Angle formed
thereby at d $\equiv$ to the Angle $e \odot d 3^{\circ} 29'$, and the Side $\odot d$
is known to be $\equiv$ to the Difference between the Semidia-
meter of the Earth's Disk and Penumbra $23' 7''$.

Now, for the Moon's Latitude when at d, say,

As Radius	90 00	10.000000
To $\odot d$	1387	3.142076
So C.S. $\angle$ at d	3 29	9.999197
To Lat. $\angle$	1384	3.141273 $\equiv 23' 4''$.

Then for the Angle Orient,

As Semidiameter X $\equiv \odot d$	1387"	3.141076
To Radius	90' 00"	10.000000
So $\angle$ Lat. at d	1384	3.141136
To C.S. $\angle$ Orient	3 29	9.999060

Lastly, In the Keplerian Method, the Latitude of the Place
is known to be North or South, by the Table of the Angle
Orient, as directed in the Sixth hereof : But when the La-
titude falls within the Polar Circles, it is doubtful.

But

But in the *Flamsteedian* Method, the Place is known to be in North or South Latitude by that of the Amplitude of the Path.

For if the Amplitude of the Path, be less than 90° , the Latitude of the Place is of the same Name with the Moon's Latitude; but if more than 90° , 'tis of a contrary Name.

If the Latitude of the Moon exceed the Semidiameter of the Earth's Disk, the Sun will not be then Centrally Eclipsed, neither on the Meridian, nor in the Nonagesime Degree. Witness the Sun's Eclipse, *June 11, 1732.*

Tenthly, These things being well understood; and also supposing the Reader to be well acquainted with my *Complete System of Astronomy*, he may now proceed to the matter in hand: And for an Example, I shall now begin with the Eclipse of the Sun that happen'd the 4th Day of *July 1730*, under the Meridian of *London*, from my Tables of *Sir Isaac Newton's Theory of the Moon.*

The

Place
Angle
e La-

But

The Time of the true Conjunction of the Sun and Moon, according to the Tables in my *Satellite Astronomy*, stands thus:

Eq. Time tr. $\odot$.	Longit. $\odot$.	Anom. $\odot$.	Hourly Mot. of
<i>Anno</i> 1730	9 20 42 12	6 12 27 14	29 43
<i>July</i> 3	6 01 21 32	6 1 21 1	2 22
<i>Hours</i> 16	39 25	39 25	27 21
<i>Minutes</i> 59	2 25	2 25	
<i>Seconds</i> 40	2	2	
<i>Mean Motion</i>	3 22 45 36	0 14 30 7	
<i>Equation sub.</i>	0 28 33		
<i>Sun's tru. Place</i>	3 22 17 03		
Eq. Time tr. $\odot$	Longit. $\odot$.	Apog. $\odot$.	Node $\odot$.
<i>Anno</i> 1730	6 19 42 42	2 18 21 10	10 6 29 16
<i>July</i> 3	8 24 27 24	20 29 57	9 44 37
<i>Hours</i> 16	8 47 03	4 27	2 7
<i>Minutes</i> 59	32 24	16	8
<i>Seconds</i> 40	22	3 8 55 50	9 46 52
<i>Mean Motion</i>	3 23 29 55	— 4 54	9 26 42 24
<i>1 Equat. add</i>	2 52	3 8 50 56	+ 2 20
<i>Moon Equated</i>	3 23 29 55	3 22 17 3	9 26 44 44
<i>2 Equat. sub.</i>	1 37	0 13 26 7	3 22 17 3
<i>Moon Equated</i>	3 23 31 10	0 26 52 14	5 25 32 19
<i>3 Equat. sub.</i>	7	+ 4 37 38	10 21 4 38
<i>Moon Equated</i>	3 23 31 03	3 13 28 34	— 0 13 33
<i>4 Equat. sub.</i>	1 14 00	3 23 31 3	9 26 31 11
<i>$\odot$ in her Orb</i>	3 22 17 03	0 10 2 29	
<i>Node sub.</i>	9 26 31 11	0 5 1 14	
<i>Arg. Lat.</i>	5 25 45 52	<i>Eccentricity--</i>	— 65727
<i>Tr. Lt. $\odot$ N.D.</i>	22 49	<i>Mean Anom.</i>	0 10 2 29
<i>Reduct. add</i>	1 4	<i>Inclin. of Lim</i>	-it 17 41
<i>Ecliptic Place</i>	3 22 18 7	<i>Simple Latit.</i>	— 21 44
		<i>Increment —</i>	1 5

As H. Mot. $\odot$ 27 21 LL 34 12 Excess 0 7
To 1 Hour, or 60 0 Proportional Part add 1 5
So Reduc. add 1 4 175 01 True Latitude N.D. 22 49
To Time Red. sub. 2 21 14 099

The Requisites being found according to that Book, must be set down thus :

	d.	h.	'	"
Equal Time true $\odot$ at London 1730, July	3	16	59	40
Equation of Time sub.	—	—	5	16
Apparent Time in the Moon's Orb	3	16	54	24
Time of Reduction sub. and add	—	—	2	21
Apparent Time ζ Ecliptic Conjunction	16	52	3	
of the ζ Middle —	16	56	43	
True Latitude of the Moon N. D.	—	—	22	49
Diff. Horiz. Parallax of $\odot$ and $\circ$ = Semid. $\odot$'s Disk	—	—	53	49
Semidiameter of the Sun — —	—	—	15	54
Semidiameter of the Moon — —	—	—	14	51
Sum is Semid. of the Penumbra, add and sub.	—	—	30	42
Sum of the Semid. of the Earth's Disk and Penumb.	—	—	84	31
Difference — — —	—	—	23	7

Here the Sum being more than the Moon's Latitude, proves an Eclipse ; and the Difference being more than the Moon's Latitude, proves, the Penumbra will all fall within the Earth's Disk, and that there are three Angles of Incidence.

Angle of $\circ$'s Orb with the Ecliptic = $e \odot f$	5	45	0
Sun's Declination North	21	38	0
Inclin. Axis Earth, and Axis Ecliptic = $\angle e \odot c$	9	22	0
First $\angle$ of Incidence = $f \odot A = f \odot I$	74	20	0
Motion of half Duration = $Af = fI = 4883''$	81	23	
Time of half Duration sub. and add	2	58	38
Second $\angle$ of Incidence = $f \odot B = f \odot H$	64	55	0
Motion of half Duration of Centr Ecl. = $Bf = fH$	48	44	
Time of half Duration Centr. Eclipse sub. and add	1	46	56
Third $\angle$ of Incidence = $f \odot d - f \odot G$	9	14	0
Motion from d to $f = 223''$	3	43	
The Time sub. and add —	8	9	
Angle of Direction = $\angle f \odot C$	15	7	0
Distance in the Earth's Axis = $\odot C 1418''$	23	38	
Motion from C to f 370	6	10	
Time the Penumbra is passing from C to f sub.	13	32	
Dist. of Center of Penumbra in Axis of Ecl. = $\odot e 1376''$	22	56	
Motion from e to f 109''	1	49	
Time the Penumbra is moving from e to f sub.	3	59	

Now,

Now, by *Precept 17, Page 411*, of my *Compleat System of Astronomy*, project the Diagram as in *Page 180*.

The outermost Circle is drawn with the Sum of the Disk and Penumbra; the next, with the Semidiameter of the *Earth's* Disk; and the innermost, with the Difference of the Penumbra and Disk, all upon the Center $\odot$.

Note, The Elevation of the Pole above the Plane of the Disk is always equal to the Declination of the Sun.

This you may prove by a Globe: For, bring the Sun's Place into the Zenith, and then the enlighten'd Pole will be just so much elevated as is the Sun's Declination.

Now, according to the Doctrine of my fore-cited Book, I have found at *London*, when the

	D. h. ' "
Eclipse first begins at Sun-rising L 1730, <i>July</i>	3 13 58 07
Central Eclipse begins at B	15 9 49
Meridional Sun Centrally Eclipsed C	16 43 13
Eclipse ends at Sun-rising	16 48 36
Nonagesime Sun Centrally Eclipsed e	16 52 3
Middle of the Eclipse f	16 56 45
Eclipse begins at Sun-setting M	17 4 54
Central Eclipse ends H at Sun-setting	18 43 41
End of the Eclipse at O Sun-setting	19 55 23
After the Penumbra has continu'd in passing } over the Earth, }	5 57 16

1. To find the Place O on the Globe, where the Sun is seen to begin to be Eclipsed at his Rising: The Center of the Penumbra is then at A.

1. By the *Keplerian* Method.

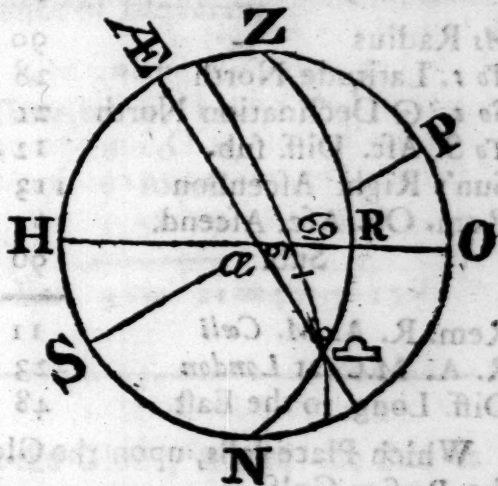
OPERATION.

	D.	h.	'	"
Apparent Time at <i>London</i> when the Penumbra first touches the Disk,	3	13	58	7
Equation of Time add			5	16
Equal Time	3	14	3	23
Sun's Place then by my Tables	5	22	10	3
Sun's Right Ascension	113	57	0	
Apparent Time from Noon add	209	31	45	
Sum, is the Right Ascension Mid-Heaven	323	28	45	
Sun's Declination North	31	39	0	

For the Angle Orient.

First Angle of Incidence = $L \odot f$	74	20	0
Angle of the Moon's Way = $f \odot e$ sub.	5	45	0
Remains Angle Orient = $L \odot e$	68	35	0

Enter the Table at the End hereof with the Sun's Place $5^{\circ} 22' 10'' 3''$; for it is the Cusp of the Ascendant; and seek in the same Line you find the Altitude of the Nonagesime Degree, which is the same with the Angle Orient $68^{\circ} 35'$, and it will give the Latitude of the Place North $18^{\circ} 22'$: Or, by Trigonometrical Calculation, in the adjacent Diagram, $E\alpha a$, is the Equinoctial, $S a$, a Part of the Ecliptic, $R a$ is a Perpendicular let fall upon the Angular Point, and cutting the Horizon at Right Angles:



As C. $\angle \alpha \approx R$ Orient	68 35	9.593542
To Radius	90 00	10.000000
So C. $\angle \alpha \approx$ Longitude	67 50	9.576689
To C. $\angle \alpha \approx R$	46 7	9.983147
Add $\angle \alpha \approx \alpha$	23 29	
Z = $\angle \alpha \approx R$	69 36	
As S. $\angle \alpha \approx R$	46 7	Co Ar. 9.142214
To S. $\angle \alpha \approx R$	69 36	9.971871
So C. S. $\angle \alpha \approx R$ $\angle$ Orient	68 35	9.562468
To S. Lat. North	28 22	9.676553

Note, This last Analogy gives the Co Sine of the Angle $\alpha \approx R$, which is the Elevation of the Equator. Therefore because the Co Sine of the Co Sine is equal to the Sine, I shall in the following Work always say, To the Sine of the Latitude.

For the Difference of Longitude.

As Radius	90 00	10.000000
To $\angle$ Latitude North	28 22	9.732351
So $\angle$ Declination North	21 39	9.598722
To S. Asc. Diff. sub.	12 23	9.331073
Sun's Right Ascension	113 57	
Rem. Ob. Asc. Ascend.	101 34	
Sub.	90 00	
Rem. R. A. M. Celi	11 34 00" + 360°	
R. A. M. C. at London	323 28 45	
Diff. Long. to the East	48 5 15 of London.	

Which Place falls, upon the Globe, near the West End of the Persian Gulf.

2. By the Flamsteedian Method.

OPERATION.

First Angle of Incidence $L \odot f$	74° 20'
Angle of Direction $f \odot C$ sub.	15 7
Amplitude of the Path $C \odot L$	59 13

As Radius — — —	90 00	10.000000
To C.S. Sun's Declin. North	21 39	9.968228
So C.S. Amplitude of the Path	59 13	9.709094
To S. Latit. of the Place North	28 24	9.677322

Fig. 1. Note, Draw the Arch of the Great Circle PO, and you will have the Right-angled Spheric Triangle PSO, in which are given SO, the Amplitude of the Path $59^\circ 13'$, the Sun's Declination (for $P \odot$ is the Sun's Distance from the Pole) to find PO, the Complement of the Latitude; and therefore because a Co Sine falls upon a Co Sine, in all the following Work I always say, To the Sine of the Latitude of the Place.

For the Difference of Meridians.

Asc. Diff. $12^\circ 23'$ reduced into Time, is	49 32
From — — —	6 0 0
True Time of Sun-rising	5 10 28
Time then at London sub.	1 58 7

Rem. Difference of Meridians East $3 12 21 = 48^\circ 51' 15''$

2. To find the Place B on the Globe, where the Sun is Centrally Eclipsed.

1. By the *Keplerian* Method.

OPERATION.

Apparent Time at London when the Central	D. h. ' "
Eclipse begins	3 15 9 49
Equation of Time add	5 16
Equal Time	3 15 15 5
Sun's true Place	22 12 29
Sun's Right Ascension	113 59 0
Apparent Time from Noon add	227 27 15
Sum is the Right Ascension <i>Med. Cali</i>	341 26 15
Sun's Declination North	21 39 0

For the *Angle Orient*.

Second *Angle of Incidence* = $f \odot B$

Angle of the Moon's Way $f \odot e$ sub.

Rem. the *Angle Orient*

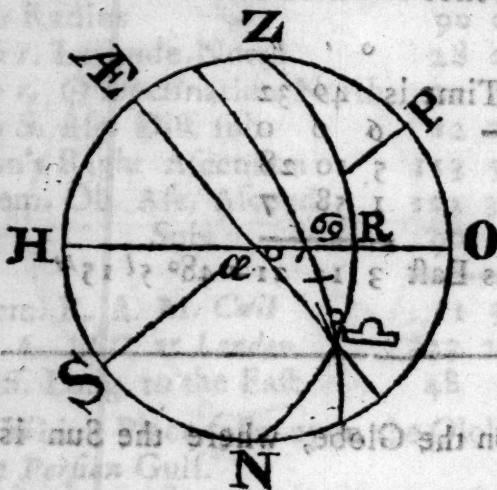
64 55

5 45

59 10

With this, and the Sun's Place in the Ascendant, 22

Degrees, 12 Minutes, 29 Seconds. Enter the Table of the *Angle Orient*, and where you find them both to meet, will on the Head of the Table be the Latitude of the Place North 36 Degrees, 50 Minutes.



Or, by Calculation,

As C. $\odot$ $\triangle$ $\odot$ R $\angle$ Orient	59 10	9.775908
To Radius	90 00	10.000000
So C. $\odot$ $\triangle$ $\odot$ R	67 48	9.577309
To C. $\odot$ $\triangle$ $\odot$ R	57 40	9.801401
Add $\angle$ α $\triangle$ $\odot$	23 29	
Z = $\angle$ α $\triangle$ $\odot$ R	81 9	

As S. $\angle$ $\odot$ $\triangle$ R	57 40	Co Ar. 0.073169
To S. $\angle$ α $\triangle$ R	81 9	9.994798
So C. $\odot$ $\triangle$ $\odot$ R	59 10	9.709730
To S. Latitude North	36 50	9.777697

For the Difference of Longitude.

As Radius	90 00	10.000000
To $\angle$ of Latit. North	36 50	9.874481
So $\angle$ $\odot$ Declin. North	21 39	9.598722
To S. Asc. Diff.	17 18	9.473203
Sun's R. Ascension	113 59	
Rem. Ob. Asc. Ascend.	96 41	
Sub.	90 00	
Rem. R.A. M.C.	6 41 0" + 360°	
Ri. A. M.C. at London	341 26 15 sub.	
Diff. Longit. East	25 14 45 of London.	

2. By the Flamsteedian Method.

OPERATION.

Second Angle of Incidence = $f \odot B$ Angle of Direction = $f \odot C$ sub.Rem. Amplitude of the Path = $\angle S \odot B$

Now, if from P you draw a great Circle to B, that it be the Distance of the Zenith of the Place from the Pole; and to find in you have given as before,

O

Then

Then say,

As Radius	90 00	10.000000
To Co. S. Declination	21 39	9.968228
So Co S. Amplitude of the Path	49 48	9.809868
To S. Latitude of the Place North	56 52	9.778096

For the Difference of Meridians.

Ascensional Diff. 17 18 reduc'd into Time is	1 9 12	sub.
From	6 0 0	
True Time Sun-rising is	4 50 48	
Time then at London sub.	3 9 49	
Difference of Meridians East	1 40 59	

Which reduc'd into Degrees, are $25^{\circ} 14' 45''$, as before.
Which Place falls on the Globe near the Eastern Coast of the
Isle of *Candia* in the Mediterranean Sea.

3. To find the Place C on the Globe, where the Sun is
Centrally Eclipsed in the Meridian.

1. By the Keplerian Method.

OPERATION.

	d.	h.	'	"
Apparent Time at London 1730, July	3	16	43	13
Equation of Time add			5	16
Equal Time	3	16	48	29
Sun's Place then	26	22	16	36
Sun's Right Ascension	114	5	0	
Apparent Time from Noon add	259	48	15	
Sum is the R.A. M. Celi at London	4	53	15	
Sun's Declination North	21	38	0	

Now, before we can find the Latitude of the Place, we
must find the nearest Distance of the Center of the Penum-
bra

bra on the Axis of the Globe to the Ecliptic, which is the same with the Moon's Latitude then, = R C.

Therefore in Figure 1, let fall the Perpendicular $c R$; and because it is parallel to $e \odot$, the Angle $\odot c R$ is known to be equal to the Angle $e \odot c$, the Inclination of the two Axes $9^{\circ} 22'$, and the Distance in the Axis of the Globe $\odot c$ is known $1418''$, to find $c R$ the Moon's Latitude.

As Radius	—	90 00	10.000000
To the Distance in the Axis = $\odot c$		1418	3.151676
So C.S. $\angle \odot c R$		9 22	9.994171
To $c R$, the Moon's Latitude		1399	3.145847

Now for the Altitude of the Nonagesime Degree.

As Semidiameter of Earth's Disk = $\odot B$	3229	3.509068
To Radius	—	90° 00' 10.000000
So Moon's Latitude = $c R$	1399	3.145847
To C.S. Alt. Nonagesime Degree	64 19	9.636779

Make $\odot R$ the Radius of a Line of Sines on the Sector, and take $c R$ in your Compasses, and apply it to the Line of Sines, shall give the Sine-Complement of the Angle Orient, or Altitude of the Nonagesime Degree, which in this case is $25^{\circ} 41'$, whose Complement is $64^{\circ} 19'$, the Altitude of the Nonagesime Degree sought, and is the same with the Calculation.

Now, you are to observe, that the Place of the Sun at the given time, is also the Cusp of the *Medium Cali*; because he is now upon the Meridian of the enquired Place: Therefore his *Right Ascension* $114^{\circ} 5'$, is also the *Right Ascension* of the Mid Heaven: To which we must find the Meridian Angle, by the 29th Problem of my *Compleat System of Astronomy*, and by Problem 33, the Distance of the Sun, or Mid Heaven (which is all one) from the Nonagesime Degree.

Then having found the Nonagesime Degree, add 3 Signs to it, and you will have the Cusp of the Ascendant at the place sought. See all the Work in its Order, as follows.

2. By the *Flamsteedian* Method.

O P E R A T I O N.

As the Semidiameter of $\odot$'s Disk	3229"	3.509068
To Radius — —	90° 00'	10.000000
So Dist. in the <i>Earth's</i> Axis	1418	3.151697
To S. Dist. $\odot$ in Merid. à Vertex	26 3	9.642629
Sun's Declination add	21 38	
Sum is the Latitude of the Place	47 41 North.	

For the Difference of Meridians.

	h.	'	"
The Time is there Noon =	24	00	00
Time at <i>London</i> sub.	16	43	13
Difference of Meridians	7	16	47
Which reduced, is 109° 11' 45" to the East of <i>London</i> . This Place falls on the Globe in <i>Great Tartary</i> .			

4. To find the Place *d* on the Globe; that is, where the Center of the *Penumbra* is, when those that live at *t*, see the Eclipse end at Sun-rising.

1. By the *Keplerian* Method.

O P E R A T I O N.

	d.	h.	'	"
Apparent Time at <i>London</i> , July	3	16	48	36
Equation of Time add			5	16
Equal Time			16	53 52
Sun's Place then by my Tables	5	22	16	50
Sun's Right Ascension		114	5	00

Apparent

Apparent Time from Noon add
 Sun, is the R. A. M. *Cal*
 Sun's Declination North

h.	°	'
252	9	00
6	14	00
21	38	00

For the Angle Orient.

Third Angle of Incidence = $f \odot d$
 Angle of the Moon's Way $f \odot e$ sub.
 Remains $\angle$ Orient = $e \odot d$

°	'
0	14
5	45
3	59

Or thus, for its Complement.

From the $\angle R \odot f$, that is, $90^\circ + \angle \text{>'s Way}$
 Sub. the $\angle f \odot d$ the $3d \angle$ of Incidence,

95	45
9	14

Remains the $\angle R \odot d$

86	31
----	----

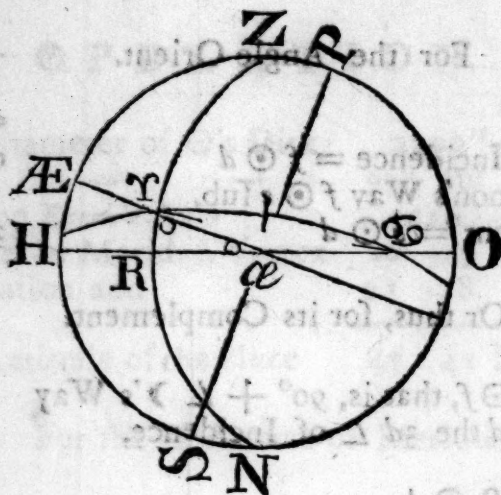
Now, with the Sun's Place *Cancer* $22^\circ 16' 50''$, being the Cusp of the Ascendant, and the Angle Orient $3^\circ 29'$ enter the following Tables: But because they cannot be found to answer therein, is a proof that the Latitude of the Place is within the Artic Circle.

Or, by Trigonometrical Calculation.

O 4

OPERA-

OPERATION. A doubtful Case.



As C.S. $\angle R \propto \gamma \angle$ Orient	3 29	11.215592
To Radius	90 00	10.000000
So C.S. $\gamma \propto$ Longitude	67 43	9.578853
To C.S. $\angle R \gamma \propto$ sub.	88 41	8.363261
From	180 00	
$\angle R \gamma \propto$	91 19	
Sub. $\angle \alpha \gamma \propto$	23 29	
= $\angle R \gamma \propto$	67 50	
As S. R. $\gamma \propto$	88 41	Co Ar. 0.000115
To S. $\angle R, \gamma \propto$	67 50	9.966653
So C.S. $\angle R \propto \gamma \angle$ Orient	3 29	9.999197
To S. Lat. North	67 37	9.965965

Now say,

As Radius	90 00	10.000000
To <i>t.</i> Lat. North	67 37	10.385282
So <i>t.</i> ☉ Decl. North	21 38	9.598354
To <i>S. A.</i> Differ.	74 22	9.983636

For

For the Difference of Longitude.

Sun's Right Ascension	114 5
Ascen. Difference sub.	74 22
X Ob. Ascen. Ascendant	39 43 + 360° = 399° 43'
Sub.	99 09
Rem. R A. M.C.	309 43
R.A. M. Cal ^d at London sub.	6 14
Diff. Longit. East of London	303 29 West 56° 31'

2. By the Flamsteedian Method.

O P E R A T I O N.

Angle of Direction = $f \odot c$	15 7
Third Angle of Incidence = $f \odot d$	9 14 sub.
Amplitude of the Path = ts	5 53

As Radius	—	90 00	10.000000
To C.S. Sun's Declination	21 38	9.968278	
So C.S. Amplitude of the Path	5 53	9.997706	
To S. Latitude North	67 37	9.965984	

For the Difference of Meridians.

h ' "	
Asc. Diff. 74° 22' in Time is	4 57 28 sub.
From —	6 00 00
Sun rises at	13 2 32 + 24 hours.
Time at London	16 48 36
Rem. Diff. Meridians East	20 13 56

Which reduced into Degrees, are 303° 29': Which Place falls on the Globe in the unknown North Sea beyond *Hudson's Bay*. This is the most Westerly of all where the Eclipse is seen.

5. To

5. To find the place e on the Globe where the Sun is Centrally Eclipsed in the Nonagesime Degree,

1. By the *Keplerian Method*.

OPERATION.

	d.	°	'	"
Apparent Time at London, 1730, July	3	16	52	3
Equation of Time add			5	16
Equal Time	3	16	57	19
Sun's place then	22	16	57	
Sun's Right Ascension	114	5	0	
Apparent Time from Noon add	253	0	45	
Sum is the R. A. M. Cali at London	7	5	45	
Sun's Declination North	21	38	0	
Moon's Lat. = Dist. in Axis Ecl. $\odot e$ nearly 1376"			22	56

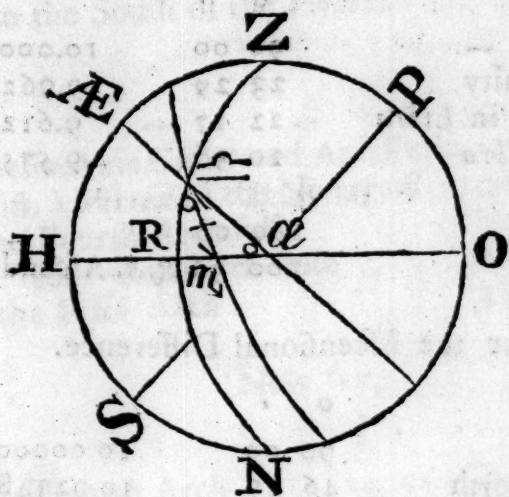
Now say,

As the Semid. of $\odot$'s Disk	3229"	3.509068
To Radius	90° 00'	10.000000
So Moon's Lat. = $\odot e$	1376	3.138618
To C.S. Alt. Nonages. Degr.	64 47	9.629550
Sun's Place = Alt. Nonag.	38.22 16 57"	
Add	3 00 00 00	
Sum, is Cusp of Ascend.	6 22 16 57	

With this Ascendant *Libra* 22° 16' 57", and the Angle Orient enter the Table following, and they will give the Latitude of the place North 46° 25'.

Or,

Or, by Calculation.



As C.t. $\angle$ R m $\approx$ Orient	64 47	9.672947
To Radius	90 00	10.000000
So C.S. $\approx$ m Longitude	22 17	9.966292
To C.t. $\angle$ R $\approx$ m	26 58	10.293345
Add $\angle$ R m $\approx$ α	23 29	
Z $\angle$ R $\approx$ α	50 27	

As S. $\angle$ R α $\approx$	26 58	Co Ar. 0.343449
To S. $\angle$ R $\approx$ m	50 27	9.887093
So C.S. $\angle$ R m $\approx$	64 47	9.629453
To S. Latitude Nor. 46 25		9.859995

Now you must find the Declination of the Cusp of the Ascendant.

As Radius	90 00	10.000000
To S. Obliquity	23 29	9.600409
So S. Longitude in <i>Libra</i>	22 17	9.578853
To S. Declination South	8 41	9.179262

For

For the Right Ascension of the Ascendant.

As Radius	—	90 00	10.000000
To C. S. Obliquity		23 29	9.962453
So ϵ . Longitude in <i>Libra</i>		22 17	9.612561
To ϵ . R. A. à <i>Libra</i>		20 36	9.575014

180 00

200 36 R.A. Ascendant.

For the Ascensional Difference.

As Radius	90 00	10.000000
To ϵ . Latitude North	46 25	10.021485
So ϵ . Declinat. South	8 41	9.183907
To S. Ascen. Diff.	9 14	9.205392
R.A. of Ascend. add	200 36	
Z Obl. Asc. Ascendant	209 50	
Sub	90 00	
R Asc. Med. Celi	119 50	
R Ascen. at London	7 5 45"	
Diff. Long. East of London	112 44 15	

2. By the Flamsteedian Method.

The Fourth *Arch* must be taken from the Sun's Distance from the same Pole that the Moon is next unto; *i. e.* If the Moon hath North Latitude, take it from the Sun's Distance from the North Pole: If the Moon hath South Latitude, take it from the Sun's Distance from the South Pole; and the Remainder is the Fifth *Arch*.

OPERATION.

As Semid. of the Earth's Disk	3229"	3.509068
To Radius	90 00	10.000000
So Dist. $\odot \epsilon$ in <i>Axis</i> of <i>Ecliptic</i>	1376	3.138618
To S. Azim. between $\odot$ & <i>Vertex</i>	25 13	9.629550

Is Compl. $64^{\circ} 47'$ is the Altit. Nonages.

Note,

Note. If the Distance of ☉ from the *Vertex* be less than the ☉'s Declination North, then the ☉ is to the North; otherwise, to the South of the *Vertex*.

As Radius	—	90 00	10.0000000
To C.S. Inclina. Axis Globe and Axis Eclip.	9 22		9.994171
So ☉ Dist. à <i>Vertex</i> in the Nonageff.	25 13		9.672947
To ☉ of the Fourth Arch sub.	24 55		9.667118
Sun's Dist. from the North Pole	68 22		
Remains the Fifth Arch	43 27		

Now say,

As C. S. the Fourth Arch	24 55	Co Ar.	0.042429
To C. S. the Fifth	43 27		9.860921
So C.S. ☉ Dist. a <i>Vertex</i>	25 13		9.936506
To S. Lat. North	46 24		9.859856

For the Difference of *Meridians*.

As S. Fifth Arch	—	43 27	Co Ar.	0.162588
To S. the Fourth		24 55		9.624591
So ☉ Inclina. of the two <i>Axes</i>		9 22		9.217356
To ☉ Hour à <i>Noon</i> when ☉ in <i>Nonag.</i>		5 46		9.004535

Given Time is 6 h. 52' 3", Complement = 7 h. 7' 57", reduced into Degrees, are 106° 59' 15"; added to the Hour from Noon in the Nonagenime Degree 5° 46', makes 112° 45' 05"; which is the Difference of Longitude to the East of London; which Place falls on the Globe in Great Tartary.

Distance
If the
Distance
e, take
the Re-

Note,

6. To find the Place M on the Globe, where the Eclipse is seen to begin at Sun-setting, and the Center of the Penumbra is then at G.

1. By the *Keplerian Method*.

OPERATION.

	d.	h.
Apparent Time at <i>London</i> , 1730, <i>July</i>	3	17 4 54
Equation of Time add		5 16
Equal Time — —	3	17 10 10
Sun's Place then	♊	22 17 28
Sun's Right Ascension —	114	6 0
Apparent Time from Noon add	256	13 30
Sum is the <i>R. A. M. Celi</i> at <i>London</i>	10	19 30
Sun's Declination North	21	38 0

For the Angle Orient.

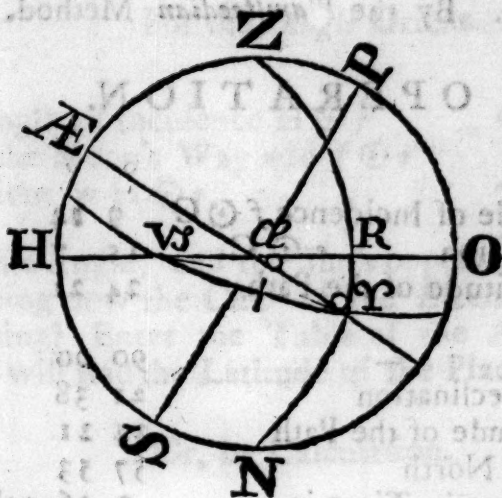
Third Angle of Incidence $f \odot G$	9	14
Angle of the Moon's Way add $f \odot e$	5	45
Z, is the Angle Orient = $G \odot e$	14	59
Sun's Place and Setting is $\odot 22^\circ 17' 28''$; therefore the Ascendant is $\vee 22^\circ 17' 28''$.		

Enter the Table of the Angle Orient with $14^\circ 59'$, and the Ascendant $\vee 22^\circ 17' 28''$, and they will give the Latitude of the Place North $57^\circ 53'$.

Or, by Calculation.

As C. $\angle \alpha \vee \gamma \angle$ Orient	14 59	10.572453
To Radius —	90 00	10.000000
Sc C. $\vee \gamma$ Longitude	67 43	9.578853
To C. $\angle \vee \gamma R$	84 12	9.006400
Sub. $\angle \vee \gamma \alpha$ Obliquity	23 29	
Remains the $\angle \alpha \gamma R$	60 43	

As



As S. $\angle$ ν γ R	84 12	Co Ar.	0.002229
To S. $\angle$ α ν γ R	60 43		9.940622
So C.S. $\angle$ α ν γ	14 59		9.984977
To S. Latitude North	57 53		9.927828

For the Difference of Longitude.

As Radius	90 00	10.000000
To ϵ . Latitude North	57 53	10.202245
So ϵ . $\odot$ Declin. North	21 38	9.598354
To S. A. Difference	39 11	9.800599
Sun's Right Ascension add	114 6	
Obl. Desc, Descend.	153 17	
Add	90 0	
R. A. M. <i>Celi</i>	243 17 0"	
R. A. M. <i>Celi</i> at London	10 19 30	
Diff. Longit. East	232 57 30	from London

By

2. By the Flamsteedian Method.

OPERATION.

The third Angle of Incidence $f \odot G$	9 14	
Angle of Direction $e \odot C$	15 7	
Z, is the Amplitude of the Path	24 21	
As Radius —	90 00	10.000000
To Co S. $\odot$ Declination	21 38	9.968278
So C.S. Amplitude of the Path	24 21	9.959539
To S. Latitude North	57 53	9.927817
Ascen. Difference in Time is	2 36 44"	
Add —	6 0 0	
Time of Sun-setting	8 36 44	+ 24 Hours.
Time at London	17 4 54	
Difference of Meridians	15 31 10	

Which reduced into *Degrees* and *Minutes*, are $232^{\circ} 51'$ 30" to the East of London, as before.

This is the most Easterly of all where the Eclipse was seen.

7. To find the Place on the Globe, where the Sun is Centrally Eclipsed at his Setting; the Center of the Penumbra is then at H.

1 by the Keplerian Method.

OPERATION.

	D. h. ' "
Apparent Time at London 1730, July	3 18 43 41
Equation of Time add —	5 16
Equal Time —	3 18 48 57
Sun's Place —	22 21 24
Sun's Right Ascension —	114 9 0
Apparent Time from Noon add	280 55 15
Sum, is the Right Ascension M. Cæli at London	35 4 15
Sun's Declination North	21 38 0

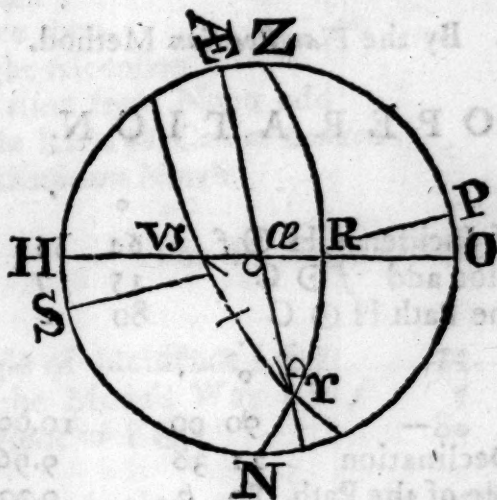
For

For the *Angle Orient.*

Second Angle of Incidence $H \odot f$	64	55
Angle of the Moon's Way add $f \odot e$	5	45
Angle Orient $= H \odot e$	70	40

With this Angle, and the Sun's opposite Place $vs\ 22^\circ\ 21'\ 24''$ (it being now the Cusp of the Ascendant, because the Sun is setting) Enter the Table of the Angle Orient, and there you will find the Latitude of the Place $9^\circ\ 15'$ North.

Or, by Calculation.



As C.t. $\angle r\ v\ \alpha\ \angle$ Orient	70 44	9.545119
To Radius	90 00	10.000000
So C.S. $vs\ r$	67 39	9.580084
To C.t. $\angle vs\ r\ R$	42 42	10.034965
Sub. $\angle vs\ r\ \alpha$ Obliquity	23 29	
Rem. $\angle \alpha\ r\ R$	19 13	
As S. $\angle vs\ r\ R$	42 42	Co Ar. 0.168668
To S. $\angle \alpha\ r\ R$	19 13	9.517382
So C.S. $\angle r\ v\ \alpha$	70 42	9.519911
To S. Latitude North	9 15	9.205961

P

For

For the Ascensional Difference, say.

As Radius	—	90 00	10.000000
To $\odot$ Latitude North		9 15	9.211815
So $\odot$ Declinat. North		21 38	9.598354
To $\odot$ A. Difference		3 42	8.810169
Sun's R. Ascension add		114 9	
Obl. Desc. Descendant		117 51	
Add		90 0	
R. A. M. Celi		207 51 0/1	
R. A. M. Celi at London		35 4 15	
Diff. Longitude East		172 46 45	

2. By the Flamsteedian Method.

OPERATION.

Second Angle of Incidence $H \odot f$	64	55
Angle of Direction add $f \odot C$	15	7
Amplitude of the Path $H \odot C$	80	2

As Radius	—	90 00	10.000000
To C.S. Sun's Declination		21 38	9.968278
So C.S. Amplitude of the Path		80 2	9.238835
To S. Latitude North		9 16	9.207113

For the Difference of Meridians:

The Arc Differ. $3^{\circ} 42'$ in Time is	h. ' "	0 14 48
Add		6 0 0
Time Sun's setting		6 14 48 + 24 Hours.
Time at London sub.		18 43 41
Diff. Meridians East		11 31 7

Which reduced into Degrees and Minutes, are $172^{\circ} 46' 45''$ East, as before. This Place falls on the Globe near the *Iles de los Reys*, East of the *Philippine Islands*.

8. By

8. To find the Place on the Globe, where the Sun sets as the Eclipse ends The Center of the Penumbra is then at I.

1. By the *Keplerian Method*.

OPERATION.

	d.	h.	'	"
Apparent Time at <i>London</i> , 1730, <i>July</i>	3	19	55	23
Equation of Time add			5	16
Equal Time	3	20	0	39
Sun's Place then	♊	22	24	16
Sun's Right Ascension		114	12	0
Apparent time from Noon add		298	50	45
Sum, is the R. A. M. <i>Celi</i> at <i>London</i>		53	2	45
Sun's Declination North		31	37	0

For the Angle Orient.

	°	'	"
First Angle of Incidence $I \odot f$	74	20	
Angle of the Moon's Way $\odot f$	5	45	
Angle Orient = $I \odot e$	80	5	

With this Angle, and with the opposite Place of the Sun $73^{\circ} 22' 24'' 16''$, being the Cusp of the Ascendant, enter the Table of the *Angle Orient*, and they will give the Latitude of the Place $0^{\circ} 29'$ North.

P 2

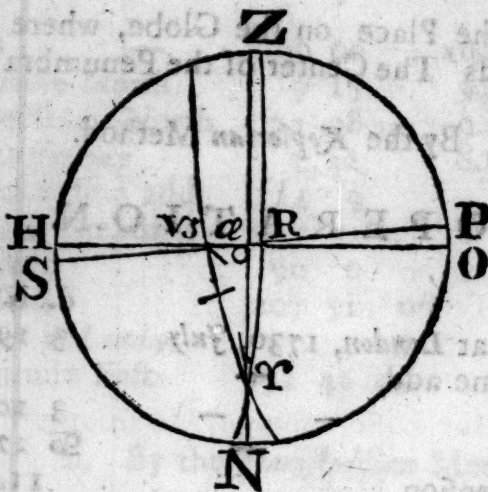
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By

Or, by Calculation.



As C. s. $\angle \gamma$ vs $\alpha \angle$ Orient	80 5	9.242610
To Radius	90 00	10.000000
So C. s. vs γ Longitude	67 36	9.581001
To C. s. $\angle$ vs γ R	24 39	10.338391
Sub. $\angle$ vs $\gamma \alpha$ Obliquity	23 29	
Rem. $\angle \alpha \gamma$ R	1 10	
As S. $\angle$ vs γ R	24 39	Co Ar. 0.379787
To S. $\angle \alpha \gamma$ R	1 10	8.308794
So C. s. $\angle \gamma$ vs α	80 5	9.236073
To S. Latitude North	0 29	7.924654

For the Difference of Longitude.

As Radius	90 00	10.000000
To s. Latitude North	0 29	7.926134
So s. $\odot$ Declin. North	21 37	9.597985
To S. A. Difference	0 12	7.524119
Sun's R. Ascen. add	114 12	
Obl. Desc. Descendant	204 24	
Add	90 0	
R. A. M. Cali	204 24 0"	
R. A. M. C. at London	53 2 45	
Diff. Longitude East	151 21 15	

e. By

2. By the *Flamsteedian* Method.

First Angle of Incidence $\odot \odot f$	74	20
Angle of Direction $f \odot C$	15	07
Sum, is the Amplit. of the Path	89	27

As Radius	90 00	10.000000
To C.S. $\odot$ Declination	21 27	9.968328
So C.S. Amplit. of the Path	89 97	7.982233
To S. Latit. of the Place North	0 31	7.950561

For the Difference of Meridians.

	h.	'	"
The Ascen. Diff. 12' in time is	0	0	48
Add	6	0	0
Time of Sun-setting	6	0	48 + 24 Hours.
Time at <i>London</i> sub.	19	55	23
Diff. Meridians to the East	10	5	25

Which reduced into Degrees and Minutes, are $151^{\circ} 21' 15''$.
Which Place on the Globe falls to the East of the *Philippine*
Islands.

9. To find the Place on the Globe where the Sun's lower is just touch'd by the Moon's upper Limb in the Meridian.

Note, that which is the Sun's upper Limb in North Latitudes, is his lower in Southern Latitudes, and so *vice versa*, So that observing by your Calculation the Latitude where the Sun is Centrally Eclipsed in the Meridian, you will easily conceive whether a Spectator must travel North or South to elevate the Moon above, or depress her below the Sun, just that their Perimeters may touch each other.

From hence it is plain, that in North Latitudes the North side of the Luminaries are their upper side, and in South Latitudes the South side of the Luminaries are their upper

side; that is, having them to the South of you in North Latitudes, and to the North of you in South Latitudes.

And this is what must guide you to know (when you have found the distance of the *Sun* from the *Vertex* in the Meridian by the following Analogy) when the *Sun* is to the North or to the South of your Zenith.

To which always apply the *Sun's* Declination at the time he is Centrally Eclipsed in the Meridian, and you will have the Latitude of that Place where the Edges of the *Sun* and *Moon* touch each other at that time.

Or, by observing what I have said of my universal Projection in Page 77, of Vol. I. of my *System*, you may easily find the Latitude of the Place thereby.

R U L E.

To the Semidiameter of the Penumbra add the Distance of the Sun in the Earth's Axis from the Center of the Disk; and if that Sum be less than the Semidiameter of the Earth's Disk, then it will always hold.

As the Semidiameter of the Earth's Disk in Seconds,
To Radius,

So is the Sum of the Semidiameter of the Penumbra, and Distance of the Moon in the Earth's Axis in Seconds,
To the Sine of the Arch of the Meridian between the *Sun* and *Vertex*.

Then by the common known Rules in Navigation, where the *Sun's* Zenith-Distance and Declination are given, to find the Latitude of the Place, Work, and you will have your desire.

Or, by my Universal Projection, if you set the *Sun's* Declination to the Distance from the *Vertex*, the two Ends of the Earth's Axis marked *S. P.* and *N. P.* will cut the graduated Meridian in the Latitude of the Place sought. See my *System*, Vol. I. Page 77.

But if the Sum of the Semidiameter of the Penumbra, and Distance of the Moon in the Earth's Axis exceed the Semidiameter of the Earth's Disk, then the *Sun's* lower will not touch the *Moon's* upper Limb in the Meridian any where.

Ex-

Example, in the present-nam'd Eclipse.

O P E R A T I O N.

Semidiameter of the Penumbra	30	42
Dist. $\curvearrowright$ in $\odot$ Axis from the Center Disk	23	38 = $\odot$ C add
Sum	54	20

This exceeding the Semidiameter of the Earth's Disk $53^{\circ} 49''$, proves it not to be seen any where : For the Sun will be depress'd below the Southern Horizon before the Moon's upper Limb touches it, as I shall further prove by and by.

10. To find the Place on the Globe, where the Sun's Upper is just touch'd by the Moon's Lower Limb in the Mid-Heaven.

R U L E.

In this Case you must take the Difference between the Semidiameter of the Penumbra, and the Distance of the Moon in the Earth's Axis from the Center of the Disk ; and then say as in the 9th above.

Example in the present named Eclipse.

P 4

OPE-

And Longitude $109^{\circ} 45'$ from London, being the place with
 the Sun is Centrally Eclipsed in the Meridian ;
 which place (in this Eclipse) would fall on the Globe near
 Japan in China if it were conspicuous ; observe the follow-
 ing Relation.

Canal shade enters the Earth on the Eastern Coast
 of the Caspian Sea, the Mouth of the Volga River,
 and from thence into the great Eastern Ocean, where it
 leaves

Ex-



OPERATION.

Semidiameter of the Penumbræ	30	42
Dist. ☾ in ☉ Axis from Center of the Disk sub.	23	38
Difference	—	7 4

Now say,

As the Semidiameter of Earth's Disk	3229"	3.509068
To Radius	90° 00'	10.000000
So is the Diff. Penumbræ and ☾ in ☉'s Axis	424	2.627366
To S. Arch Merid. betw. ☉ & Vertex Sou.	7 33	9.118298
Sun's Declination North add	21 38	
Latitude of the Place North	29 11	

And Longitude $109^{\circ} 9' 45''$ from *London*, being the same with that where the Sun is Centrally Eclipsed in the Meridian; which Place (in this Eclipse) would fall on the Globe near *Tchute* in *China*, if it were conspicuous; observe the following Caution.

The Central Shade enters the Earth on the Eastern Coast of the Isle *Candia*, near the Entrance of the *Archipelago* Sea, and bends its Course over the North Parts of *Asia Minor*, and the *Caspian* Sea, thro' *Great Tartary* and the *Japan* Sea, and from thence into the great Eastern Ocean, where it leaves

leaves it about the *Isles de los Reys*, where the Sun may be seen to set Centrally Eclipsed; so that the *Central Shade* travels East, as the following Work shews.

Sun rises Centrally Eclips. in the Longit. 25 13 45 East.
Sun sets Centrally Eclips. in the Longit. 176 46 45 East.

Difference in Longitude 151 33 0

Miles in one Degree 69.5

735

1323

882

10216.5

Add

33

English Miles 10249 $\frac{1}{2}$ the Central
Shadow travels Eastward.

For the Breadth of the Shade from North to South.

OPERATION.

From a Quadrant — 90 0
Sub. Lat. where ☉'s upper is touch'd by ☾'s lower Edge 29 11
Dist. of that Place from the North Pole 60 49
Sun's Declination North add 21 38
Breadth of the Shadow 82 27

Miles in one Degree 69.5

410

738

492

5699.0

Add

27

English Miles 5726

Note,

Note, The $27'$ are $\frac{3}{4}$, which will be reduced to $\frac{1}{4}$; but it being so inconsiderable in this case, it matters not whether it is altered or not.

Caution.] Note, The Breadth of the shadow $82^{\circ} 27'$, being less than a Quadrant, also proves that the Sun's lower Edge is not any where touched by the Moon's upper in the Meridian: For if you travel Northward beyond the Pole, until you be $82^{\circ} 27'$ distant from the Sun, there will be a small Portion of the Sun's lower Limb obscured from your sight, by the Interposition of the Moon,

And if you go on further, until you be 90 Degrees distant from the Sun, you will then have him in the Horizon, before he is got clear of the Eclipse; so that it is impossible for the Sun's lower Limb to be touched by the Moon's upper, any way in this Eclipse.

For the Velocity of the Shadow in this Eclipse.

OPERATION.

True hourly Motion $\text{☾} \text{ à } \text{☉}$ $27' 21''$ Decimally	27.35
Miles in one Degree on the Earth's surface	69.5

13675

24615

16410

Moons Shad. travels in an Hour English Miles	1900.825
--	----------

Which divided by 60', gives 31.68 Miles in a Minute; a Motion, indeed, that would require *Pegasus* or *Perseus's* Horse to keep pace with it.

When you have finished your Eclipse, it will be best to construct it for those Latitudes (according to Precept 18. Page 419. of my *System*) where you find by Calculation the Sun and Moons upper and lower Limbs just touch in the Meridian, and that will strengthen your Judgment, and confirm your Work.

C H A P. XVI.

The Calculation of the principal Appearances of the Sun's Eclipse, April 11, 1735.

Eq. Timetr. $\odot$.	Longit. $\odot$.	Anom. $\odot$.		
	' 0 1 11	S. 0 1 11		
Anno 1735	9 20 29 42	6 12 9 27		
April 11	3 9 33 1	3 9 32 44		
Hours 11	27 6	27 6		
8' 56 11	2 18	2 18		
Mean Motion	1 0 32 6	9 22 11 35		
Equation add	1 46 51			
Sun's tru. Place	1 2 18 57			
Eq. Timetr. $\odot$	Longit. $\odot$.	Anom. $\odot$.	Node $\odot$.	
Anno 1735	4 19 48 37	7 8 0 34	6 29 47 30	
April 11	8 10 48 57	7 29 33 50	5 20 54	
Hours 11	6 2 21	5 59 17	1 27	
Minutes 56	30 45	30 29	7	
Seconds 8	4	4	5 22 28	
Mean Motion	1 7 10 44	3 14 4 14	6 24 25 2	
Equat. sub.	4 51 47			
$\odot$ in her Orb	1 2 18 57		1 11	
Node sub.	6 24 25 2			
Arg. Lar.	6 7 53 55	Hourly Mot. of	5 $\odot$ 2 26	
True Lat. S. A.	41 11		34 31	
Reduct. sub.	1 47	Hourly Mo. $\odot$ a	$\odot$ 32 5	
Ecliptic Place	1 2 17 10			

Equal

	d.	h.	'	"
Equal Time, true $\odot$ at London 1735, April	11	11	56	8
Equation of Time add			1	40
Apparent Time	11	11	57	48
Time of Reduction subtract and add			3	20
Apparent Time Middle	11	11	54	28
of the $\searrow$ Ecliptic Conjunction	11	12	1	8
Diff. Hor. Parall. $\odot$ and $\searrow$ = Semid. <i>Earths</i> Disk			58	18
Sem. diameter of $\begin{cases} \text{Sun} \\ \text{Moon} \end{cases}$			15	58
Sum, = Semidiameter of the Penumbra			31	52
Sum <i>Earths</i> Disk and Penumbra			90	10
Difference <i>Earths</i> Disk and Penumbra			26	26
True Latitude of the Moon <i>S. A.</i>			41	11
True Hourly Motion of $\searrow$ à $\odot$			32	5
Angle of the Moons Way = $e \odot d$			5° 38	0
Angle of the two Axes = $e \odot c$			20	10 0
Angle of Direction = $d \odot C$			14	32 0
Suns Declination North			12	18 0
First Angle of Incidence = $d \odot A$			62	49 0
Motion of half duration = $A d$ 4812" =			1	20 12
Time of half duration subtract and add			2	30 38
Second Angle of Incidence = $d \odot B$			45	4 0
Motion of half duration Centr. $B d$ = 2476"			0	41 16
Time of half duration Central sub. and add			1	17 7
Dist. Moon in <i>Earths</i> Axis = $\odot C$ 2552"			42	32
Motion from C to d = 640.6"			10	40
The same in Time sub.			19	58
Dist. Moon in Axis Ecliptic = $\odot e$	2483"	=	41	23
Moons Latitude at C = $C R$	2396	=	39	56

By the above Calculation, I have found, when

	d.	h.	'	"
The Eclipse first begins at Sun-rising A April	11	9	23	50
Centrally eclipsed at Sun-rising B	10	37	21	
Meridional Sun Centrally Eclipsed C	11	34	30	
Middle at d	11	54	28	
Nonagesimal Sun Centrally Eclipsed e	12	1	8	
Central Eclipse ends at Sun-setting F	13	11	35	
The Eclipse ends at Sun-setting G	14	25	6	
After the Penumbra has spent in passing over $\odot$	5	1	16	

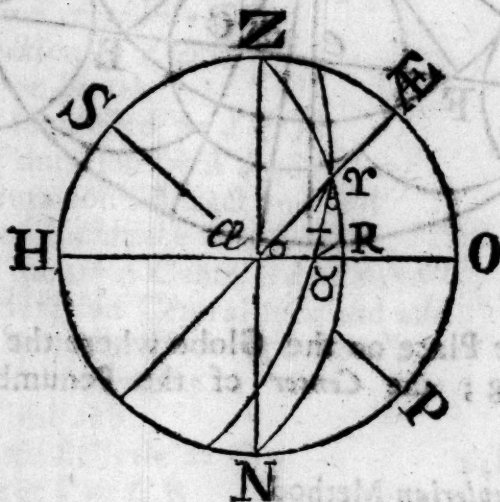
I. To

1. By the *Keplerian* Method

OPERATION.

Apparent Time at *London* 1735, *April*
Equation of Time sub.
Equal Time
Sun's true Place
Sun's Right Ascension
Apparent Time from Noon add
Sum, Right Ascension M. *Celi* at *London*
Sun's Declination North

d.	h.	'	"
II	9	23	50
		I	40
II	9	22	10
Ø	2	12	43
	30	I	0
	140	57	30
	170	58	30
	12	16	0



For the Angle Orient

First Angle of Incidence = $d \odot A$
 Angle of the Moon's Way = $c \odot d$ add
 Angle Orient = $e \odot A$

0	1
62	49
5	38
68	27

As C
To R
So C.
To C.
Add
Z =

As S.
To S.
So C.S
To S.

As Ra
To t. 1
So t. C
To S. A
Sun's 1
Obl. A

R. A. M.
R. A. M.
Longid

This
South of

2. E

First An
Angle o
Amplitu

Now

Now, for the Latitude of that Place.

As C. Angle $\gamma \delta R$ Orient	68 27	9.5965088
To Radius	90 00	10.0000000
So C.S. $\gamma \delta$	32 13	9.927396
To C. Angle $\delta \gamma R$	25 1	10.330888
Add $\alpha \gamma \delta$	23 29	
Z = $\angle \alpha \gamma R$	48 30	
As S. $\delta \gamma R$	25 1	Co Ar. 0.373781
To S. $\alpha \gamma R$	48 30	9.874456
So C.S. $\alpha \delta \gamma$	68 27	9.565036
To S. Latitude South	40 35	9.813273

For the Longitude.

As Radius	90 00	10.000000
To ϵ . Latitude S.	40 35	9.932778
So ϵ . $\odot$ Declination North	12 16	9.337311
To S. Asc. Difference	10 44	9.270089
Sun's Right Ascension Add	30 1	
Obl. Asc. Ascendant	40 45	+360
Sub.	90 0	
R. A. M. Celi	310 45	0/1
R. A. M. Celi at London	170 58	30
Longitude East	139 46	30

This Place falls on the Globe in the unknown Ocean South of *Hollandia Nova*.

2. By the *Flamsteedian* Method.

OPERATION.

First Angle of Incidence = $d \odot A$	62 49
Angle of Direction = $d \odot C$	14 32
Amplitude of the Path $C \odot A$	48 17

Now

As

As Radius	—	90 00	10.000000
To C. S. Amplitude of the Path		48 17	9.823114
So C. S. Sun's Declination		12 16	9.989970
To S. Latitude South		40 34	9.813084

For the Longitude of that Place.

Ascen. Difference in Time is	0 42 56
Add	8 0 0
Time of Sun-rising there	6 42 56 + 12 Hours.
Time at London sub.	9 23 50
Longitude East	9 19 6 = 139° 46' 30"

2. To find the Place B on the Globe, where the Center of the Pedumbra is, when the Sun rises Centrally Eclipsed.

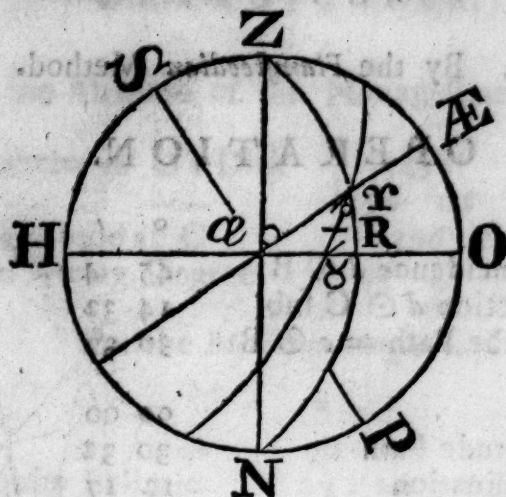
1. By the Keplerian Method.

Apparent Time at London, 1735, April	d. h. ' "	11 10 37 21
Equation of Time subtract		1 40
Equal Time	—	11 10 35 41
Sun's true Place	—	8 2 15 41
Sun's Right Ascension	—	30 4 0
Apparent Time from Noon add		159 20 15
Sum, is R. A. M. Cali at London		189 24 15
Sun's Declination North	—	12 17 0

For the Angle Orient.

Second Angle of Incidence = $d \odot B$	45 4 0
Angle of the Moon's Way = $e \odot d$ add	5 38 0
Angle Orient = $e \odot b$	50 42 0

For



For the Latitude of the Place.

As C. t. $\gamma \delta R \angle$ Orient	50	42	9.913014
To Radius	90	00	10.000000
So C. S. $\gamma \delta$ Longitude	32	16	9.927151
To C. t. $\delta \gamma R$	44	4	10.014137
Add $\angle \alpha \gamma \delta$	23	29	
$Z = \alpha \gamma R$	67	33	

As S. $\delta \gamma R$	44	4	Co Ar. 9.977706
To S. $\alpha \gamma R$	67	33	9.965772
So C. S. $\gamma \delta R$	50	42	9.801665
To S. Latitude South	57	19	9.925143

For the Longitude of that Place.

As Radius	90	00	10.000000
To r. Lat. South	57	19	10.192751
So r. $\odot$ Declin. North	12	17	9.334871
To S. Ascen. Difference	19	42	9.527622
R. Ascen. Sum add	30	4	
Obl. Asc. Ascen.	49	46	
Sub.	90	0	
R. A. M. Cali	319	46	011
R. A. M. Cali at London	189	24	15
Longitude East	130	21	45

This Place falls on the Globe in the unknown Southern Ocean.

Q

2. By

For

2. By the *Flamsteedian* Method.

OPERATION.

Second $\angle$ of Incidence $d \odot B$	45 4	
Angle of Direction $d \odot C$ sub.	14 32	
Amplitude of the Path $= c \odot B$	30 32	
As Radius	90 00	10.000000
To C.S. Amplitude Path	30 32	9.935171
So C.S. $\odot$ Declination	12 17	9.989912
To S. Latitude South	57 19	9.925083

For the Longitude of that Place.

Ascensional Difference in Time	1 18 48	
Add	6 0 0	
Time of Sun-rising there	7 18 48	+ 12 Hours.
Time at <i>London</i> sub.	10 37 21	
Longitude East	8 41 27	= 130° 21' 45"

3. To find the Place C on the Globe, where the Center of the Penumbra is when the Sun is Centrally Eclipsed in the Meridian.

1. By the *Keplerian* Method.

OPERATION.

	D. h. ' "	
Apparent Time at <i>London</i> 1735, April	11 11 34	30
Equation of Time sub.	—	1 40
Equal Time	11 11 32	50
Sun's true Place	♄	2 18 0
Sun's Right Ascension	—	30 6 0
Apparent Time from Noon add	173	37 30
Right Ascension M. Cali at <i>London</i>	203	43 30
Sun's Declination North	12	18 0

For

For the Altitude of the Nonagesime Degree.

As Semidiameter of ☉'s Disk	3498"	3.543820
To Radius	90 00	10.000000
So Moon's Latitude at C	2396	3.379405
To C.S. Alt. Nonag. Degree	46 47	9.835585

For the Meridian Angle say,

As Radius	90 00	10.000000
To S. Obliquity Ecliptic	23 29	9.600409
So C.S. R.A. M.C. = ☉ R. A	30 6	9.937092
To C.S. Meridian Angle	69 50	9.537501

For the Dist. M. Celi from Nonagesime Degree.

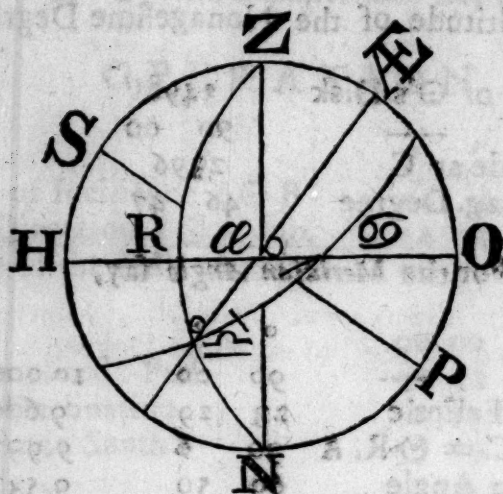
As Radius	90 00	10.000000
To C.S. Alt. Nonagesime	46 47	9.972948
So C.S. Meridian Angle	69 50	9.564983
To S. Dist. M.C. a Nonag.	20 11	9.537931

Now read Page 196.

Sun's true Place	☉ 2 18 0
Dist. subtract	20 11 0
Nonagesime Degree	0 12 7 0
Add always	3 0 0 0
Cusp of the Ascendant	3 12 7 0

For the Latitude of the Place.

As C.S. ☉ ☽ ∠ Orient	46 47	9.972948
To Radius	90 00	10.000000
So C.S. ☉ ☽ Longitude	77 53	9.322019
To C.S. R. ☽ ☉	77 25	9.349071
Sub. ☉ ☽ ☉	23 29	
Rem. R. ☽ ☉	53 56	



As S. R. $\simeq$ $\odot$	77 25	Co Ar. 0.010559
To S. R. $\simeq$ α	53 56	9.907590
So C.S. α $\odot$ $\simeq$	46 47	9.835538
To S. Lat. S.	34 33	9.753687

For the Longitude of that Place.

R.A. $\odot$ is now R. A. M. Celi	30° 61' + 360°
R.A. M. Celi at London sub.	203 43 30"
Longitude to the East	186 22 30

Th's Place falls on the Globe in the unknown Southern Ocean.

2. By the *Elamstedian* Method.

OPERATION.

As Semidiameter $\odot$'s Disk	3498"	3.543820
To Radius —	90 00	10.000000
So Dist. $\simeq$ in Earth's Axis	2552	3.406881
To S. Dist. $\odot$ from Vertex	46 51	9.863061
Sun's Declin. North sub.	12 18	
Latitude South	34 33	

For

For the Longitude of that Place.

	h.	'	"
Time is there Noon =	24	0	0
Time at <i>London</i> sub.	11	34	30
Diff. of Meridians East	12	25	30 = 186° 22' 30"

4. To find the Place *e* on the Globe, where the Sun is Centrally Eclipsed in the Nonagesime Degree.

1. By the *Keplerian* Method.

OPERATION.

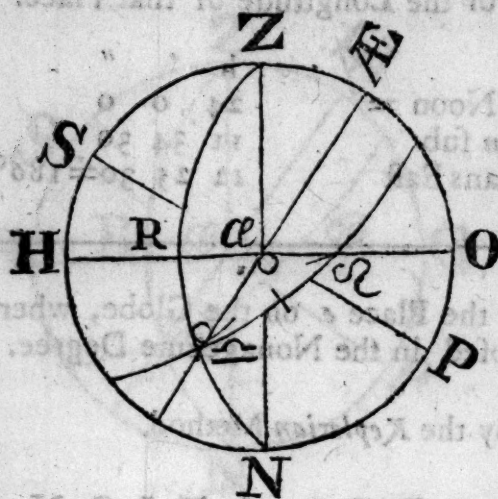
	d.	h.	'	"
Apparent Time at <i>London</i> 1735, April	11	12	1	8
Equation of Time sub.			1	40
Equal Time	11	11	59	28
Sun's true Place	♈	2	19	4
Sun's Right Ascension		30	7	0
Apparent Time from Noon add		180	17	0
Sum, R. Ascension <i>M. Cali</i> at <i>London</i>		210	24	0
Suns Declination North		12	18	0

For the Altitude of the Nonagesime Degree.

As Semidiameter of the <i>Earths</i> Disk	3498"	3 543820
To Radius	90 00	10.000000
So Dist. <i>D</i> in Axis Ecliptic	2483	3 394977
To C.S. Altitude Nonagesime	44 48	9.851157
Suns Place = to Nonages. Degree	1 2 19'	
Add	3 0 0	
Sum, = to Cusp Ascendant	4 2 19	

Q 3

For



For the Latitude of that Place.

As C.t. α ρ Orient	44 48	10.003032
To Radius	90 00	10.000000
So C.S. ρ Longitude	57 41	9.728027
To C.t. R ρ	62 2	9.724995
Sub. $\angle$ α ρ	23 29	
Rem. R. ρ α	38 33	

As S. R. ρ ρ	62 2	Co Ar. 0.053931
To S. R. ρ α	38 33	9.794626
So C.S. R ρ ρ	44 48	9.850996
To S. Latitude South	30 3	9.699553

1. For the Declination of the Ascendant ρ $29^{\circ} 19'$.

As Radius	90 00	10.000000
To S. Longitude ρ ρ	57 41	9.926911
So S. Obliquity	23 29	9.600409
To S. Declination North	19 41	9.527320

2. For

2. For the Right Ascension Ascendant Ω $2^{\circ} 19'$.

	0	
As Radius	90 00	10.000000
To C.S. Obliquity	23 29	9.962453
So ϵ . Longitude	57 41	10.198884
To ϵ . from <i>Libra</i> sub.	55 23	10.161337
From	180 0	
Right Ascension	124 37	

3. For the Ascensional Difference of the Ascendant Ω $2^{\circ} 19'$

	0	
As Radius	90 00	10.000000
To ϵ . Latitude South	30 3	9.762314
So ϵ . Declination North	19 41	9.553548
To S. Asc. Difference add	11 57	9.315862
R. A. Ascendant add	124 37	
Obl. Asc. Ascendant	136 34	
Sub.	90 0	
R. A. <i>M. Caeli</i>	46 34	+360°
R. A. <i>M. Caeli</i> at <i>London</i> sub.	210 24	
Longitude East	196 10	

This Place falls on the Globe in the unknown Southern Ocean.

2. By the Flamsteedian Method.

OPERATION.

As Semidiameter of the Sun's Disk	3498"	3.543820
To Radius	90 00	10.000000
So Dist. $\odot$ in Axis Ecliptic	2483	3.394977
To S. Azim. between $\odot$ and Vertex	45 13	9.851157

Q 4

Now

Now say,

As Radius	90 00	16.000000
To C. S. Inclination of the Axis	20 10	9.972524
So ϵ . Sun's Distance from Verrex	45 13	10.003032
To ϵ . of the Fourth Arch	43 23	9.975556

Now read Page 204.

Sun's Distance from the South Pole	102 18
Fourth Arch subtract	43 23
Remains the Fifth Arch	58 55

Now say,

As C. S. of the Fourth Arch	43 33	Co Ar.	0.138601
To C. S. of the Fifth Arch	58 55		9.712889
So C. S. $\odot$'s Dist. from Verrex	45 13		9.847836
To S. Latitude South	30 2		9.699326

For the Longitude of that Place.

As S. of the Fifth Arch	58 55	Co Ar.	0.067315
To S. of the Fourth	43 23		9.836878
So ϵ . Inclination of the Axis	20 10		9.564583
To ϵ . Hour from Noon in Nonag.	16 24		9.468776

Now read Page 205.

From	24 0 0	h. ' "
Sub. Time at London	12 1 8	
Complement	11 58 52	= 179° 43'
Add the Hour from Noon	16 24	
Sum, is the Longitude East from London	196 7	
West	163 53	

5, Te

5. To find the Place F on the Globe, where the Sun is seen to set Centrally Eclipsed.

2. By the *Keplerian Method*.

OPERATION.

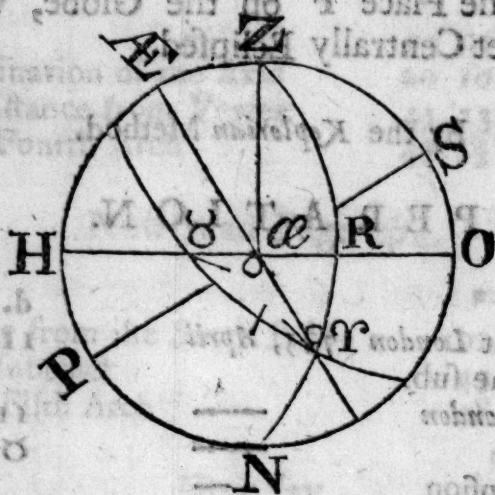
	d.	h.	'	"
Apparent Time at London 1735, April	11	13	11	35
Equation of Time sub.			1	40
Equal Time at London	11	13	9	55
Sun's true Place	♈	2	21	56
Sun's Right Ascension		30	10	0
Apparent Time from Noon add	197	53	45	
Sum, Right Ascension M. Cal ^d at London	228	3	45	
Sun's Declination North	12	19	0	

For the Angle Orient.

Second Angle of Incidence = $d \odot F$	45	4
Angle of the Moon's Way = $e \odot d$	5	38 sub.
Angle Orient = $F \odot e$	39	26

For

For the Latitude of the Place.



As C. γ δ R Orient	39 26	10.084926
To Radius	90 00	10.000000
So C.S. δ γ Longitude	32 22	9.926671
To C. δ γ R	55 13	9.841745
Sub. δ γ α	23 29	
Rem. α γ R	31 44	
As S. δ γ R	55 13	Co Ar. 0.085489
To S. α γ R	31 44	9.720958
So C.S. γ δ R	39 26	9.887822
To S. Latitude South	29 39	9.694269

For the Longitude of that Place.

As Radius	90 00	10.000000
To δ . Latitude South	29 39	9.755291
So δ . $\odot$'s Declination North	22 19	9.339133
To S. Ascensional Diff. sub.	7 8	9.094424
Sun's Right Ascension	30 10 from	
Oblique Desc. Descendant	23 2	

Add

	°	'	"
Add	90	00	00
Sum. R. A. M. Cali	113	2	00
R. A. M. Cali at London sub.	228	3	45
Rem. Longitude East	244	58	15

This Place falls on the Globe in the Pacifick Ocean.

2. By the *Flamsteedian* Method.

OPERATION.

Second Angle of Incidence = $F \odot d$	45	4
Angle of Direction $d \odot C$ add	14	32
Sum, Amplit. of the Path = $F \odot C$	59	36

As Radius	90	00	10.0000000
To C. S. Amplitude	59	36	9.704179
So C.S. $\odot$ Declination	12	19	9.989887
To S. Latitude South	29	38	9.694066

For the Longitude.

	h.	'	"
Ascen. Diff. in Time is	0	28	32 sub.
From	6	0	0
Time Sun-setting there	5	31	28 + 24 Hours.
Time at London sub,	13	11	35
Longitude East	16	19	53 = 244° 58' 15"

6. To

Add

6. To find the Place G on the Globe, where the Center of the Penumbra is, when the Sun is seen to set as the Eclipse ends.

1. By the *Keplerian Method*.

OPERATION.

	d.	h.	'	"
Apparent Time at <i>London</i> , 1735, <i>April</i>	11	14	25	6
Equation of Time sub.			1	40
Equal Time	11	14	23	26
Sun's Place then	♈	2	24	55
Sun's Right Ascension		30	13	0
Apparent time from Noon add		216	16	30
Sum, is the R. A. M. <i>Celi</i> at <i>London</i>		246	29	30
Sun's Declination North		12	20	0

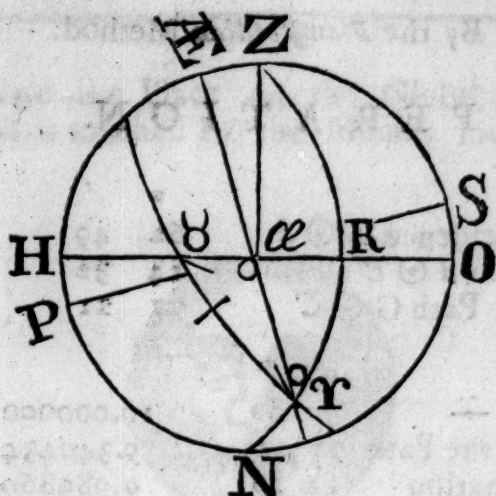
For the Angle Orient:

First Angle of Incidence = $G \odot d$	62	49
Angle of the Moon's Way = $e \odot d$	5	38
Angle Orient = $G \odot e$	57	11

Now, for the Latitude of that Place,

As C. γ $\odot$ R. Orient	57	11	9.809471
To Radius	90	00	10.000000
So C.S. $\odot$ γ Longit.	32	25	9.926431
To C. $\odot$ γ R.	37	23	10.116960
Sub. $\odot$ γ α	23	29	
Rem. α γ R	13	54	

As



As S. δ γ R	37 23	Co Ar. 0.216708
To S. α γ R	13 54	9.380624
So C.S. γ δ R	57 11	9.733961
To S. Lat. South	12 23	9.331293

For the Longitude of that Place.

As Radius	—	90 00	10.000000
To <i>t.</i> Latitude South		12 23	9.341552
So <i>t.</i> ☉ Declinat. North		12 20	9.339739
To S. Asc. Difference sub.		2 46	8.681291
Sun's Right Ascension		30 13	from
Obl. Asc. Descendant		27 27	
Add		90 00	
<i>R. A. M. Celi</i>		117 27	+ 360°
<i>R. A. M. Celi</i> at London sub.		246 29	30"
Longitude East		230 57	30

This Place falls on the Globe, in the *Mare del Zur*.

2. By the *Flamsteedian* Method.

O P E R A T I O N.

First Angle of Incidence $G \odot d$	62	49
Angle of Direction $d \odot C$ add	14	32
Amplitude of the Path $G \odot C$	77	21
o "		
As Radius —	90 00	10.000000
To C.S. Ampl. of the Path	77 21	9.340434
To C.S. $\odot$ Declination	12 20	9.989860
To S. Latitude South	12 21	9.330294

For the Longitude of that Place.

Ascen. Diff. in Time is sub.	0 11 4	
From	6 0 0	
Time Sun-setting there	5 48 56	+ 24 Hours.
Time at London sub.	14 25 6	
Diff. Meridians East	15 23 50	= 230° 57' 30"
From	360 0 0	
Longitude from London West	129 2 30	

7. To find the Place on the Globe, where the Sun's lower is just touch'd by the Moon's upper Limb in the Meridian.

O P E R A T I O N.

Semidiameter of the Penumbra	31	52
Moon's Distance in Earth's <i>Axis</i> add	42	32
Sum	74	24
Exceeds the Semid. of the Earth's Disk	58	18

Which proves, this Phænomenon will not be any where conspicuous.

8. To

8. To find the Place on the Globe, where the Sun's upper Limb is touched by the Moon's lower Limb in the Meridian.



OPERATION.

Semidiameter of the Penumbra	31	52
Dist. Moon in Earths Axis South	42	32
Difference	10	40

Now say,

As Semidiameter Earth's Disk	3498"	3.543820
To Radius	90 00	10.000000
So Difference in Seconds	640	2.806180
To S. Arch Merid. ☉ & Vertex	10 33	9.262360
Sun's Declination North	12 18	
Rem. Latitude North	1 45	

This Place falls on the Globe, in the unknown Ocean, North of *Mare del Zur*.

The

The Central Shade of the Moon in this Eclipse first toucheth the Globe in the unknown South Ocean Lat. $57^{\circ} 19' S$. and Long. $130^{\circ} 21' 45'$ East; and bends its Course North-Easterly, where in the same Ocean it gives the last stroke, and goes down Centrally Eclipsed; but will scarce be seen by any, by reason of its Remoteness from the *European* Traders. The *Shadow* passes over the Globe with a Velocity of 37 Miles in a Minute of Time.

In any *Solar Eclipse*, when there are three Angles of Incidence (which I have explained in Page 181.) that Place on the Globe, where the *Sun* rises as the Eclipse ends, is the most remote Place to the West of *London* that sees any thing of the Eclipse; and where the Eclipse begins at *Sun setting*, the most remote Place East of *London* that sees any thing of it.

But if there are only two Angles of Incidence, that Place, where the *Sun* rises Centrally Eclipsed, is the remotest place Westward from *London*; and that place where he sets Centrally Eclipsed, is the remotest place East, that sees any thing of that Eclipse.

These things being rightly understood, when you have finished the Work of any Eclipse, according to the above Directions, have recourse to a Terrestrial Globe, and lay a Thread from the Place where the *Sun* rises as the Eclipse ends, in the first Case, to the place where the Eclipse begins at *Sun setting*; or, from the place, on the Globe, where the *Sun*, in the second Case, rises Centrally Eclipsed, to the place where he sets Centrally Eclipsed; and that Thread, or a Chalk so drawn, shall represent the Passage of the Center of the Moon's shadow over that part of the Globe during the time of the Eclipse.

CHAP.

CHAP. XVII.

The Calculation of the principal Appearances of the Sun's Eclipse, July 24, 1739.

Eq. Time tr. σ .	Longit. $\odot$.	Anom. $\odot$.		
	' 0 ' 11 S. 0 ' 11			
Anno 1739	9 20 31 30	6 12 7 11		
July 24	6 22 3 27	6 22 2 52		
Hours 3	7 24	7 24		
Minutes 49	2 1	2 1		
Seconds 47	2	2		
Mean Motion	4 12 44 24	1 4 19 30		
Equation add	1 4 27			
Sun's tru. Place	4 11 39 57			
Eq. Time tr. σ	Longit. $\odot$.	Anom. $\odot$.	Node $\odot$.	
Anno 1739	10 10 31 28	7 15 57 20	4 12 25 27	
April 24	6 1 9 39	5 8 19 21	10 51 21	
Hours 3	1 38 49	1 37 59	24	
Minutes 49	26 54	26 40	6	
Seconds 47	26	26	10 51 51	
Mean Motion	4 13 47 16	0 26 21 46	1 33 36	
Equat. sub.	2 7 19			
Node in her Orb	4 11 39 57		$\odot$ 2 24	
Node sub.	4 1 33 36	Hourly Mot. of	$\odot$ 29 55	
Arg. Lat.	0 10 6 21			
True Lat. S. A.	52 35	Tr. Hourly Me.	$\odot$ 27 31	
Reduct. sub.	2 15			
Ecliptic Place	4 11 37 42			

R

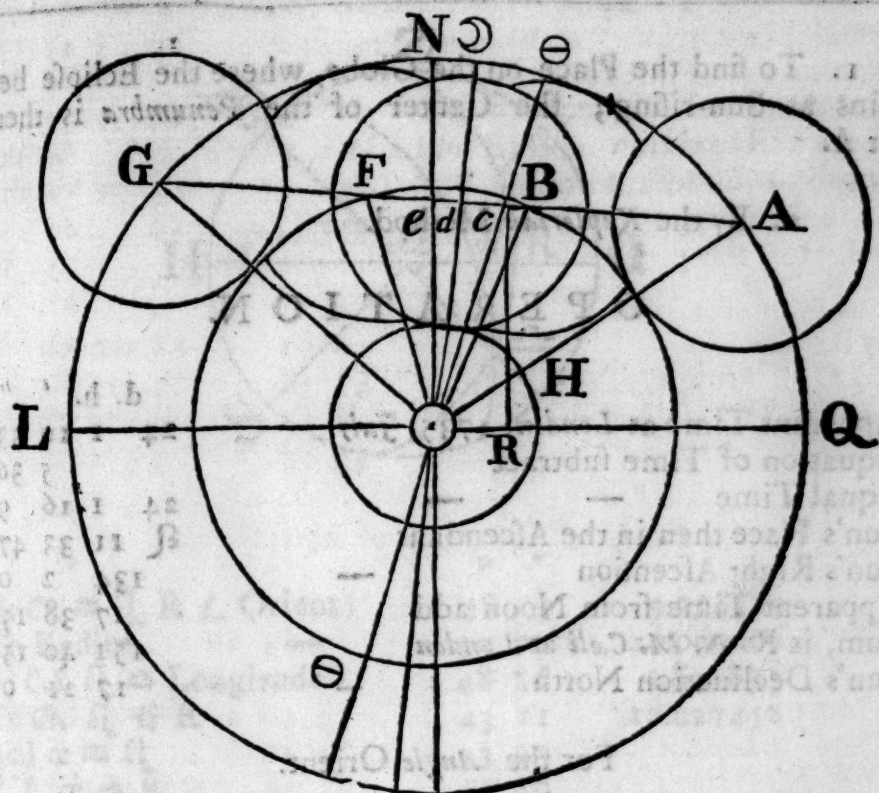
Equal

	d.	h.	'	"
Equal Time, true $\odot$ at London 1739, July	24	3	49	47
Equation of Time sub.			5	36
Apparent Time	24	3	44	11
Time of Reduction subtract and add			4	54
Apparent Time, Middle 1739, July	24	3	39	17
of the Ecliptic Conjunction	24	3	49	5
Diff. Hor. Parall. $\odot$ and $\bigcirc$ = Semid. <i>Earths</i> Disk			55	5
Semidiameter of $\left\{ \begin{array}{l} \text{Sun} \\ \text{Moon} \end{array} \right.$			15	52
Sum, = Semidiameter of the Penumbra			31	6
Sum, <i>Earths</i> Disk and Penumbra = $\odot A$			86	11
Difference <i>Earths</i> Disk and Penumbra = $\odot H$			22	59
True Latitude of the Moon N A = $\odot d$			52	35
True Hourly Motion of $\bigcirc$ à $\odot$			27	31
Angle of the Moons Way = $e \odot d$			5°	41' 0"
Angle of the two <i>Axes</i> = $e \odot c$			16	7 0
Angle of Direction = $d \odot C$			10	26 0
Suns Declination North			17	19 0
First Angle of Incidence = $d \odot A$			52	24 0
Motion of half duration = $d \odot c$ 4097"			1	8 17
Time of half duration subtract and add			2	28 44
Second Angle of Incidence = $d \odot B$			17	20 0
Motion of half duration Centr. = $d B$ 984.6" =			16	24.6
Time of half duration sub. and add			35	47
Dist. Moon in <i>Earths</i> Axis = $\odot C$ 3208"			53	28
Motion from C to d = 581"			9	41
The same in Time sub.			21	7
Dist. Moon in Axis Ecliptic = $\odot e$ 3171"			52	51
Moons Latitude at C = $C R$ = 3082"			51	22

Now, according to Precept 17, of my *System*, I have by the above *Calculation*, found the times when

	d.	h.	'	"
The Eclipse begins at Sun-rising A 1739, July	24	1	10	33
Centrally Eclipsed at Sun-rising B		3	3	30
Meridional Sun Centrally Eclipsed C		3	18	10
Middle at d		3	39	17
Nonagesimal Sun Centrally Eclipsed e		3	49	5
Central Eclipse ends at Sun-setting F		4	15	4
The Eclipse ends at Sun-setting G		6	8	1
Total Duration is		4	57	28

You



You are always to observe, that that Pole which is of the same Name with the Sun's Declination, is always illuminated ; which in this Scheme falls in the Earth's *Axis* near *C* ; which Pole is purposely omitted, to prevent crowding the Figure too much.

To find the Pole in the enlightned Disk in any Projection (of this nature) make the Semidiameter of the Earth's Disk the Radius of a Line of *Sines* on the *Sector* ; and from thence take the *Sine* of the $\odot$'s Distance from the nearest Pole, and set it in the Projection from $\odot$ to *P* in the Earth's *Axis*, and that gives the place of the enlighten'd *Pole* in the Earth's Disk ; and it is the North Pole, if the Sun hath North Declination ; but the South, if he hath South Declination.

1. To find the Place on the Globe, where the Eclipse begins at Sun-rising; the Center of the *Penumbra* is then at A.

1. By the *Keplerian Method*.

OPERATION.

	d.	h.	'	"
Apparent Time at London, 1735, July	24	1	10	33
Equation of Time subtract			5	36
Equal Time	24	1	16	9
Sun's Place then in the Ascendant	♈	11	33	47
Sun's Right Ascension		134	2	0
Apparent Time from Noon add		17	38	15
Sum, is R. A. <i>M. Celi</i> at London		151	40	15
Sun's Declination North		17	21	0

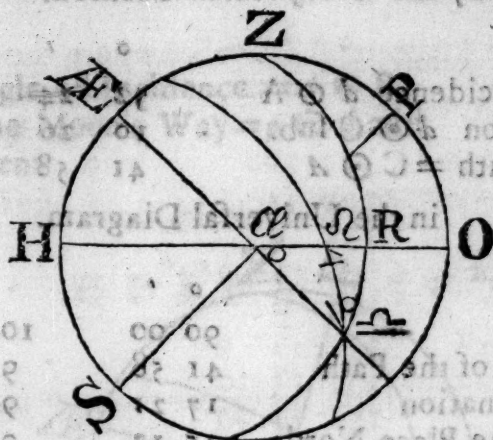
For the *Angle Orient*.

First Angle of Incidence $d \odot A$	52	24
Angle of the Moon's Way $= e \odot d$ add	5	41
Angle Orient $= e \odot A$ in Scheme above	58	05

For the Latitude of the Place in the following Scheme.

As

Bs C
To R
So C.
To C
Add o
Z L
As S.
To S.
So C.S
To S.
As Rad
To t. L
So t. C
To S. A
Sun's R
Rem. C
R. A. M
R. A. M
Longitu
This l
tween C



Bs Ct. $\approx \Omega$ R $\angle$ Oriental	58 5	9.794382
To Radius	90 00	10.000000
So C.S. $\Omega \approx$ Longitude	48 26	9.821835
To C.S. Ω R	43 11	10.027452
Add $\alpha \approx \Omega$	23 29	
Z $\angle \alpha \approx$ R	66 40	
As S. $\Omega \approx$ R	43 11	Co Ar. 0.164731
To S. $\alpha \approx$ R	66 40	9.962945
So C.S. $\approx \Omega$ R	58 5	9.723197
To S. Latitude North	45 11	9.850873

For the Longitude of this Place.

As Radius	90 00	10.000000
To $\angle$ Latitude North	45 11	10.002779
So $\angle$ $\odot$'s Declination North	17 21	9.494743
To S. Ascensional Difference sub.	18 20	9.497522
Sun's Right Ascension from	134 2	
Rem. Oblique Ascension	115 42	
Sub.	90 00	
R. A. M. Calc.	25 42	0' 14" 360
R. A. M. Calc at London	151 40 15	
Longitude East	234 1 45 W.	125° 58' 15"

This Place falls on the Globe, in the unknown Ocean, between China and America.

2. By the Flamsteedian Method.

First Angle of Incidence $d \odot A$	32	24
Angle of Direction $d \odot C$ sub.	10	26
Amplit. of the Path $= C \odot A$	41	58

in the Universal Diagram.

As Radius	90 00	10.000000
To C.S. Amplit. of the Path	41 58	9.871301
So C.S. $\odot$ Declination	17 21	9.979776
To S. Latit. of the Place North	45 12	9.851077

For the Difference of Meridians.

The Ascen. Diff. in time is	1 13 20	
From 2 29 20	6 10 10	
Time of Sun rising	4 46 40	+ 24 Hours
Time at London sub.	1 10 33	
Diff. Meridians to the East	15 36 7	= 134° 1' 45"

(as before.)

2. To find the Place B on the Globe, where the Center of the *Penumbra* is when the Sun is seen to rise Centrally Eclipsed.

1. By the Keplerian Method.

OPERATION.

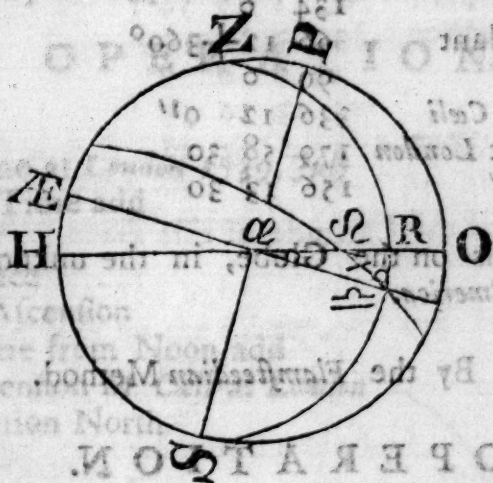
Apparent Time at London, 1739, July	d. h. m.	24 3 30
Equation of Time add		5 36
Equal Time		24 3 9 6
Sun's true Place		11 38 18
Sun's Right Ascension		134 6 0
Apparent Time from Noon add		45 52 30
Sum R.A.M. $\odot$ at London		179 58 30
Sun's Declination North		37 40 9

For the Angle Orient.

Second Angle of Incidence = $d \odot B$
 Angle of the Moon's Way = $e \odot d$ add
 Angle Orient

0
 17 20

5 41
 23 11



For the Latitude of the Place.

As C. $\alpha \odot R$	23 1	10.371797
To Radius	90 00	10.000000
So. C.S. $\alpha \odot R$	48 22	9.822404
To C. $\alpha \odot R$	74 14	9.459607
Add $\alpha \odot R$	23 29	
Z = $\alpha \odot R$	97 43	Compl. $82^{\circ} 17'$

As S. $\alpha \odot R$	74 14	Co Ar. 0.016635
To S. $\alpha \odot R$	82 17	9.996066
So C.S. $\alpha \odot R$	23 1	9.963972
To S. Lat. North	71 23	9.956693

R 4

For

For the Longitude of this Place.

As Radius	10000000	10000000
To $\angle$ Latitude North	71 23	100472749
So $\angle$ Declin. North	17 20	9.494399
To S.A. Difference	67 54	9.966848
Sun's R. Ascen.	134 6	
Obl. Asc. Ascendant	66 12	+360°
Sub.	90 0	
R. Ascension M. Caeli	336 12 01'	
R. A. M. Caeli at London	179 58 30	
Longitude East	156 13 30	

This Place falls on the Globe, in the unknown Ocean, North-West of *America*.

2. By the *Flamsteedian* Method.

OPERATION.

Second $\angle$ of Incidence $d \odot B$	17 20
Angle of Direction $d \odot C$ sub.	10 26
Amplitude of the Path = $C \odot B$	6 54
As Radius	10000000
To C.S. Amplitude of the Path	6 54
So C.S. Sun's Declination	17 20
To S. Latitude North	71 22

For the Difference of Meridians:

Asc. Difference in time is	d. h. m.
From	4 31 36
Time Sun-rising	6 0 0
Time at London sub.	3 28 24 + 12 Hours.
Diff. Meridians East	3 3 30
	10 24 54 = 156° 13' 30".

3. To

3. To find the Place C on the Globe, where the Center of the *Penumbra* is, when the Sun is Centrally Eclipsed in the Meridian.

i. By the *Keplerian Method*.

OPERATION.

	d	h	m
Apparent Time at London 1739, July	24	3	18 10
Equation of Time add			5 36
Equal Time	24	3	23 46
Sun's true Place	♑	11	38 54
Sun's Right Ascension		134	7 0
Apparent Time from Noon add		49	32 30
Sum, R. Ascension M. Cali at London		183	39 30
Sun's Declination North		17	19 0

For the Altitude of the Nonagefime Degree.

As Semidiameter of the Earths Disk	3305"	3 519 171
To Radius	90° 00'	10.0000000
So D's Latitude at C	3082	3 488 833
To C.S. Altitude Nonagefime Degr.	21 10	9.969662

For the Meridian Angle.

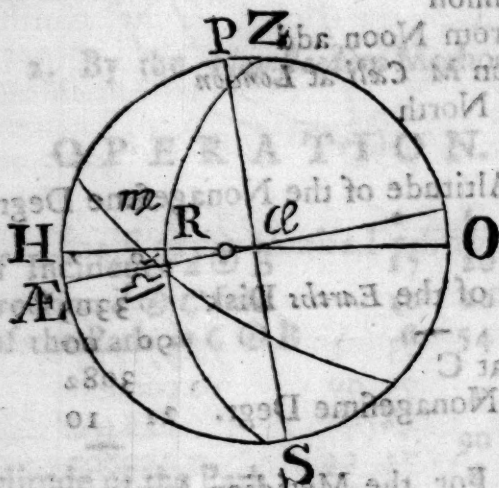
As Radius	90° 00'	10.0000000
To S. Obliquity	23 29	9.600409
So C.S. R.A. M.C. = ☉ R.A.	45 33	9.842685
To C.S. Meridian Angle	73 34	9.443094

For

For Distance M.C. from Nonagesime Degree.

As Radius	90 00	10.000000
To C. Alt. Nonag. Degree	21 10	10.412059
So C. Meridian Angle	73 54	9.460349
To S. Dist. M.C. à Nonag.	48 12	9.872408
Sun in the Meridian	11 38 54	
Rem. Nonag. Degree	2 23 26 54	
Add	3 0 0 0	
Cusp Ascendant	5 23 26 54	
Complement = $\cap$	0 6 33 6	

For the Latitude of this Place.



As C. $\cap$ R	21 10 00	10.412059
To Radius	90 00	10.000000
So C.S. $\cap$	6 33	9.997136
To C. $\cap$ R	68 58	9.385097
From $\cap$ ce	156 31	Comp! $\cap$ 23° 29'
Rem. R $\cap$ ce	87 33	

As S. ☉ R	68 58	Co Ar. 0.029945
To S. R. ☉ ∞	87 33	9.999603
So C.S. ☉ R	21 10	9.969865
To S. Lat. North	86 33	9.993213

Beyond the North Pole.

For the Longitude of that Place.

	h.	'	"
R. Ascen. ☉ now is R. A. M. Cali	134	7	0 + 360°
R. A. M. C. at London sub.	183	39	30
Longitude East from London	310	27	30
Longitude West	49	32	30

This Place falls on the Globe, in the North Frozen Sea, North-East of Great Tartary.

2. By the Flamsteedian Method.

OPERATION.

As Semidiameter ☉ 's Disk	3305"	3.519171
To Radius	90 00	10.000000
So Dist. ☉ in Earth's Axis	3208	3.506234
To S. Dist. ☉ from the Vertex	76 5	9.987063
Sun's Declination North add	17 19	
Sum	93 24	Sub. from 180°
Latitude North	88 36	beyond the Pole

For the Longitude of that Place.

	h.	'	"
Time is there Noon	24	0	0
Time at London sub.	3	18	10
Rem. Longitude East	20	41	50 = 310° 27' 30" as above

4. For

4. To find the Place, on the Globe, where the Sun is Centrally Eclipsed in the Nonagesime Degree.

1. By the Keplerian Method.

OPERATION.

	d.	h.	'	"
Apparent Time at London, 1739, July	24	3	49	5
Equation of Time sub.				36
Equal Time	24	3	54	41
Sun's Place then	Leo	11	40	8
Sun's Right Ascension		134	8	0
Apparent time from Noon add		57	16	45
Sum, is the R. A. M. Celi at London		191	24	15
Sun's Declination North		17	19	0

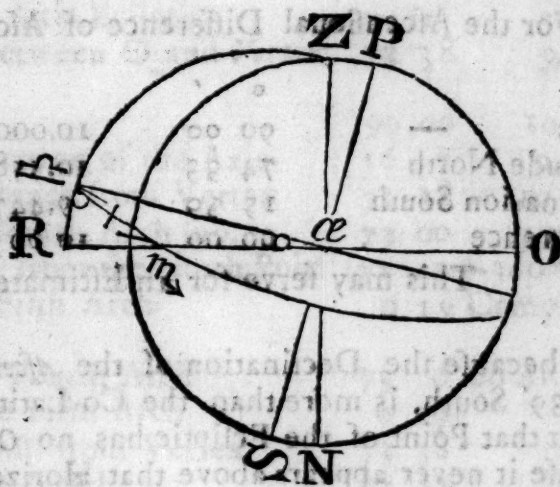
For the Altitude Nonagesime Degree.

As Semidiameter Earth's Disk	3305"	3.519171
To Radius	9900	10.000000
So Dist. 2's Axis Ecliptic	3171	3.501196
To C.S. Altitude Nonagesime	1624	9.982025

The Complement of this is $73^{\circ} 38'$. Q's Distance from the Verrex: the same with the first Operation in the Flamsteedian Method.

Sun's Place is = Nonag. Deg. 48.	11	40	8
Add	3	00	00
Sum is the Cusp Ascend.	7	11	49

As C. R. $\angle$ m $\angle$ Orient	16 22	10.532120
To Radius	90 00	10.000000
So C. S. $\angle$ m Longirude	48 20	9.873335
To C. R. $\angle$ m	77 38	9.541215
Add $\angle$ m $\angle$ ∞	23 29	
Z $\angle$ R $\angle$ ∞	101 7	
From	180 0	
Remains	78 53	



As S. R. $\angle$ m	77 38	Co Ar. 0 01 196
To S. R. $\angle$ ∞	78 53	9.991774
So C. S. R. $\angle$ m	16 22	9.982035
To S. Lat. North.	74 33	9.984008

For the Declination of the Ascendant $\angle$ $11^{\circ} 40' 8''$

As Radius	—	90 00	10.000000
To S. Longirude	—	41 40	9.822688
So S. Obliquity	—	23 29	9.600409
To S. Declination South		15 39	9.423097

2. For

As Radius	90 00	10.000000
To C.S. Obliquity	23 29	9.962453
So ϵ . Longitude	41 40	9.949353
To ϵ . of	39 13	9.911806
Add	180 0	
R. A. Ascendant	219 13	
R. A. M. Celi	191 24	
	27 49	

3. For the Ascensional Difference of Ascendant.

As Radius	90 00	10.000000
To ϵ . Latitude North	74 33	10.558486
So ϵ . Declination South	15 39	9.447384
To A. Difference	00 00	10.005870

This may serve for an Estimate.

Hence, because the Declination of the *Ascendant* $m 11^{\circ} 40' = 15^{\circ} 39'$ South, is more than the Co-Latitude $15^{\circ} 27'$, proves that that Point of the Ecliptic has no *Oblique Ascension*; because it never appears above that Horizon.

But, if you take for the Latitude of the Place $74^{\circ} 21'$, and work as in the last Work above, you will find the fourth proportional Sine to be equal to Radius 10.000000, or Sine of 90° .

So that when ever the like Case happens, you may save the trouble of working the two last Analogies.

To prove this, take a Globe, and elevate the Pole $74^{\circ} 33'$, and moving it round, you will find $m 11^{\circ} 40'$ will not ascend the Horizon.

2. By

2. By the *Flamsteedian* Method.

O P E R A T I O N.

As Semidiameter Earth's Disk	33054	3.519171
To Radius	90 00	10.000000
So Dist. $\sphericalangle$ in Axis Ecliptic	3171	3.501196
To S. Azim. between $\odot$ and Vertex	73 38	9.982025
As Radius	90 00	10.000000
To C. S. Inclination of the Axis	16 7	9.982587
So t . Sun's Distance from Vertex	73 38	10.532120
To t . of the Fourth Arch sub.	73 00	10.514707
Sun's Distance from the North Pole	72 41 + 360 ^a	
Remains the Fifth Arch	0 19	Complement
As C. S. of the Fourth Arch	73 0	Co Ar. 0.534065
To C. S. of the Fifth Arch	0 19	9.999993
So C. S. $\odot$'s Dist. from Vertex	73 38	9.449915
To S. Latitude North	74 32	9.983973

For the Longitude of that Place.

As S. of the Fifth Arch	0 19	Co Ar. 2.257523
To S. of the Fourth Arch	73 0	9.980596
So t . Inclination Axis	16 7	9.460829
To t . Hour à Noon in Nonag.	88 51	11.698948

	h.	'	"
From	24	0	0
Time at London	3	49	5
Complement	20	10	55 = 302° 33' 45"
Add Hour from Noon	88	51	0
Longitude East	31	24	45

2. By

5. To

5: To find the Place **F** on the Globe, where the Sun is seen to set Centrally Eclipsed.

1. By the *Keplerian Method*.

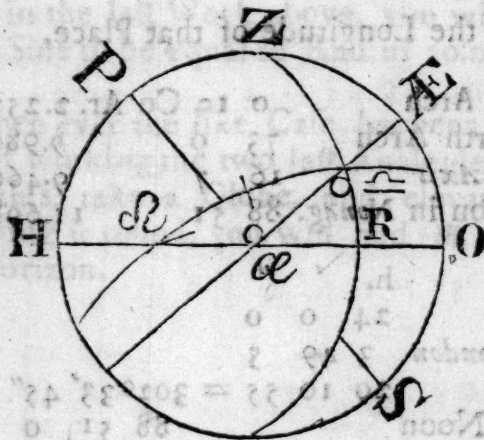
	d.	h.	m.
Apparent Time at <i>London</i> 1739, <i>July</i>	24	4	15
Equation of Time add			5 36
Equal Time at <i>London</i>	24	4	20 40
Sun's true Place	♋	11	41 9
Sun's Right Ascension		134	9 0
Apparent Time from Noon add		63	46 0
Sum, Right Ascension <i>M. Celi</i> at <i>London</i>		197	55 0
Sun's Declination North		17	19 0

For the Angle Orient.

Second Angle of Incidence = $F \odot d$ 177 20

Angle of the Moon's Way = $e \odot d$ sub. 5 41

Angle-Orient = $F \odot e$



As $\odot$ to $\odot$	11 39	10.685753
To Radius	90 00	10.000000
So C.S. $\odot$	48 19	9.822830
To C. $\odot$ $\odot$ R	82 11	9.137077
Sub. $\odot$ $\odot$	23 29	
Angle $\odot$ $\odot$ R	58 42	

As S $\odot$ $\odot$ R	82 11	Co Ar. 0.004054
To S. $\odot$ $\odot$ R	58 42	9.931691
So C.S. $\odot$ $\odot$	11 39	9.990960
To S. Lat. North.	56 25	9.926705

For the Longitude of that Place:

As Radius	90 00	10.000000
To $\odot$ Latitude North	56 25	10.177846
So $\odot$ $\odot$ Declin. North	17 19	9.493854
To S. Asc. Difference	28 0	9.671700
Sun's R. Ascen. add	134 9	
Obl. Desc. Descend.	162 9	
Add	90 0	
R.A. M. Cali	252 9	
R. A. M. Cali at London	197 55	
Longitude East	54 14	

This Place falls on the Globe in the Eastern Parts of Mos-
covia.

2. By the Flamsteedian Method.

OPERATION.

Second $\angle$ of Incidence $F \odot d$	17 20
Angle of Direction $d \odot C$ add	10 26
Amplitude of the Path $= F \odot c$	27 46

As Radius	90 00	10.000000
To C.S. Amplitude Path	27 46	9.946871
So C.S. ☉ Declination North	17 19	9.979855
To S. Latitude North	56 25	9.926726

For the Longitude of that Place.

	h.	'	"
Afc. Diff. in Time is	1	52	0
Add	6	0	0
Time of Sun-setting there	7	52	0
Time at London sub.	4	15	4
Longitude East	3	56	4 = 54° 14' as before.

6. To find the Place G on the Globe, where the Center of the Penumbra is when the Sun is seen to set as the Eclipse ends.

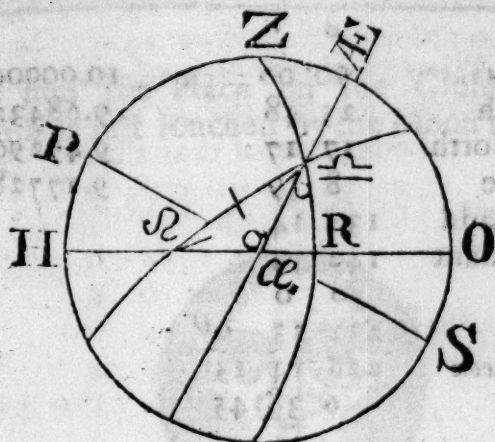
1. By the Keplerian Method.

	D.	h.	'	"
Apparent Time at London 1739, July	24	6	8	1
Equation of Time sub.	—	—	—	5 36
Equal Time add	—	24	6	13 37
Sun's true Place	—	♑	11	45 41
Sun's Right Ascension	—	134	14	0
Apparent Time from Noon add	—	192	0	15
Sum, Right Ascension M. Cali at London	—	226	14	15
Sun's Declination North	—	17	17	0

For the Angle Orient.

First Angle of Incidence G ☉ d	52	24
Angle of the Moon's Way ☉ d sub.	3	41
Rem. Angle Orient	46	43

For



For the Latitude of the Place.

As C.S. α $\angle$ $\triangle$	46 43	9.973907
As Radius	90 00	10.000000
So C.S. $\triangle$ $\angle$	48 14	9.823538
To C.S. $\angle$ $\triangle$ R	54 44	9.849631
Subtract $\angle$ $\triangle$ α	23 29	
Rem. α $\triangle$ R	31 15	
As S. $\angle$ $\triangle$ R	54 44	Co Ar. 0.088058
To S. α $\triangle$ R	31 15	9.714977
So C.S. α $\angle$ $\triangle$	46 43	9.836075
To S. Latitude North	25 48	9.639110

For the Longitude.

S 2

For

For

For the Longitude of that Place.

As Radius	90 00	10.000000
To ϵ . Latitude North	25 48	9.684324
So ϵ . $\odot$'s Declin. North	17 17	9.492964
To S. Asc. Difference	8 39	9.177288
Sun's R. Ascension add	134 14	
Obl. Desc. Descendant	142 53	
Add	90 0	
R. A. M. Cali	232 53 00	
R. A. M. Cali at London	226 14 15	
Longitude East	6 38 45	

This Place falls on the Globe, near *Techart* in *Barbary*, a Province of *Biledulgerid*, North-East from the *Lybian Desert*.

2. By the *Flamsteedian* Method.

OPERATION.

First Angle of Incidence $G \odot d$	32 14
Angle of Direction $d \odot C$ add	10 26
Amplitude of the Path $G \odot C$	62 50

As Radius	90 00	10.000000
To C.S. Ampl. of the Path	62 50	9.659517
So C.S. $\odot$ Declination	17 17	9.979951
To S. Latitude North	25 51	9.639468

For the Longitude.

Ascen. Diff. in Time is	h. ' "
Add	0 34 36
Time Sun-setting there	6 0 0
Time at London sub.	6 34 36
Longitude East	6 8 1
	0 26 35 = 6° 38' 45"

7. To

7. To find the Place on the Globe, where the Sun's upper Limb is just touched by the Moon's lower Limb in the Meridian.



OPERATION.

Semidiameter of the Penumbra	31	6
Dist. Moon in Earths Axis	53	28
Difference	22	12

Now say,

As Semidiameter Earth's Disk	3305"	3.519171
To Radius	90 00	10.000000
So Difference	1342	3.127752
To S. Dist. ☉ from Vertex	23 57	9.608581
Sun's Declination North add	17 17	
Sum Latitude North	41 14	

This Place falls on the Globe, in the North West Parts of Persia, near the Caspian Sea.

S 3

8. To

8. To find the Place on the Globe, where the Sun's lower is touch'd by the Moon's upper Limb in the Meridian.

OPERATION.

Semidiameter of the Penumbra	31	6
Moon's Distance in Earth's Axis add	53	28
Sum	84	34

This being more than the Semidiameter of the Earth's Disk, proves, this Phænomenon is not any where conspicuous.



The Central Shade first enters on the Globe, in the unknown Ocean North-West of *America*, and bends its Course Easterly, tending towards the South, passing over the Northern Parts of *America*, crossing the *Hyperborean Sea*, *Norway*, *Swedeland*, the *Baltic*, and the Gulph of *Finland*, where it enters *Moscovia*, near *Petersburgh*, and leaves the Earth near the Eastern Parts of *Moscovy*, where the Sun will set Centrally Eclipsed.

The

The Moon's Shadow passeth over the Earth with a Velocity of almost 32 Miles in a Minute; which is but a slow pace in comparison to what it goes when the Moon is in Perigeon; for then the Shadow travels with a Velocity of 41 Miles, 2 Furlongs, 37 Poles in a Minute, if it happens about the Middle of *June*; but at any other time of the Year its Velocity is something less.

And if the Eclipse happens at the Moon's Apogee; the Shadow moves only 31 275 Miles in a Minute, if this falls in the Middle of *December*; but at any other time something more.

So that the two Extrems of the Motion of the Shadow of the Moon over the Earth's Disk during the time of a Solar Eclipse, are 41 and 31 Miles in a Minute of time, omitting the Fractional Parts of a Mile, .296 and .275.

Sound only goes 11 Miles in a Minute; but Light travels with such a prodigious Velocity, that it almost surpasses our Understanding: For when the Earth is in Perihelion, its Motion is no less than 15255859 Miles in a Minute of time. See my *System*, Vol. 1. Page 442.

To exercise the young Tyro in these matters, I shall here subjoin the Times of the Great Eclipse of the Sun, that will happen in 1748, according to the Tables in my *System*, using the new Equation in Page 111, of this Book.

	d. h. "
Equal time true $\odot$ 1748, <i>July</i>	13 23 28 25
Sun and Moon in	Leo 2 42 34

Hence the Apparent time at *London* of the

Beginning 1748, <i>July</i>	—	13 21 4 55
Visible Conjunction	—	22 39 58
Greatest Obscuration	—	22 40 49
End	—	14 0 19 1
Total Duration	—	3 14 6
Digits Eclipsed are on the upper side	—	10 26 13

S 4

The

The Times of the General Eclipse fall thus, viz.

Apparent time at London of the

	d.	h.	"
Beginning at Sun-rising, 1748, July	13	20	26 29
Central Eclipse begins at Sun-rising		21	40 34
Central Eclipse in the Meridian		23	3 9
Central Eclipse in the Nonagesime Degree		23	19 49
Middle, being at		23	25 7
End of the Central Eclipse, at Sun-setting		1	9 40
End at Sun-setting		2	23 45
Duration		5	57 16

The Latitudes and Longitudes where those Appearances happen, are,

	Lat.	Long.
Sun begins to be Eclipsed at his Rising	35 9 N.	51 10 W.
Rises Centrally Eclipsed	45 23	76 17
Centrally Eclipsed in the Meridian	51 38	14 13 E.
Centrally Eclipsed in the Nonagesime	48 47	20 8
Sun sets Centrally Eclipsed	10 30	76 22
Ends at Sun-setting	0 14 S.	53 59
Sun's upper toucht by Moon's lower Limb	21 19 N.	14 13
Sun's lower toucht by Moon's upper Limb beyond the Pole.		

CHAP.

C H A P. XVIII.

To find by the Terrestrial Globe, the principal Appearances of Solar Eclipses.

1. **GIVEN** the Cusp of the Ascendant, with the Angle Orient, or Altitude of the Nonagesime Degree, to find where the Sun rises as the Eclipse begins.

E X A M P L E.

Let it be required to find the principal Appearances of the Sun's Eclipse, *July 24, 1739*?

Solution. I. For the Latitude.

Bring the Sun's Place $\mathcal{Q} 11^{\circ} 33'$ to the Eastern Horizon, and there stay the Globe: Then take 3 Signs from the Sun's Place, and there remains $\mathcal{O} 11^{\circ} 33'$ for the Place of the Nonagesime Degree, which mark with a Chalk in the Ecliptic.

Then move the Brazen Meridian in the Notches of the Wooden Horizon, until the Place of the Nonagesime Degree be elevated $58^{\circ} 5'$; then will the North of the Northern cut the Brazen Meridian at $45^{\circ} 11'$, the Latitude of the Place North.

2. **For the Difference of Meridians, or Longitude from London.**

Bring the Sun's Place in the Ecliptic $\mathcal{Q} 11^{\circ} 33'$ to the Brazen Meridian, and there make a Mark with Chalk: Let the Globe be elevated to the Latitude of the Place just now found; bring *London* to the Meridian, and set the Index to the Time of the Eclipse 1 h. 11'.

Now move the Globe, till the Index point at 12 at Noon; and that Place on the Globe under the Mark made on the Brazen Meridian, is the Place where the Sun is Vertical at that time; bring this Place to the Eastern Horizon, and the

the Meridian cuts the Equator in $125^{\circ} 58'$ West of London; which Place is in the unknown Ocean, where the Sun will begin to rise just as the Eclipse begins.

2. To find the Place where the Sun will Rise Centrally *Eclipsed*

1. For the Latitude.

The Sun's Place is *Leo* $11^{\circ} 38'$, the Altitude of the Nonagesime Degree $23^{\circ} 1'$, and the time at London 3' past 3.

SOLUTION.

Bring the Sun's place in the *Ecliptic* $11^{\circ} 38'$ to the Eastern Horizon; then 3 Signs subtracted from it, leaves $8^{\circ} 11' 38'$, the place of the Nonagesime Degree; which mark with Chalk. Then move the Meridian in the Notches of the Horizon, till you have the place of the Nonagesime $8^{\circ} 11' 38'$ elevated upon the Quadrant of Altitude $23^{\circ} 1'$; then will the Notch of the Northern Horizon cut the Meridian at $71^{\circ} 23'$, which is the Latitude of the place sought.

2. For the Difference of Longitude.

Bring the Sun's Place to the Brazen Meridian, and there mark the Meridian with Chalk; elevate the Globe to the Latitude of the Place just found; bring London to the Meridian, and set the Index to the time of the Eclipse 3' past 3; move the Globe, till the Index point at 12 at Noon: Here stay the Globe, and observe what place is under the Mark made on the Brazen Meridian; for there the Sun is Vertical at the given Time.

Bring this place (being marked with Chalk) to the Eastern Horizon, and the Degree of the *Equator* $156^{\circ} 13'$ that now lies under the Brazen Meridian is the Longitude of the place sought; Which place falls on the Globe, in the unknown Ocean; where the Sun will be seen to rise Centrally *Eclipsed*, it being in the Zenith, or highest part of the Globe at that time.

3. To

3. To find where the Sun is *Centrally Eclipsed* in the Nonagesime Degree.

1. For the Latitude.

Sun's Place $\mathcal{Q}$ $11^{\circ} 40'$, the Altitude of the Nonagesime Degree $16^{\circ} 22'$ and the time at *London* is 49' past 3 in the Afternoon.

SOLUTION.

Mark the Sun's Place in the *Ecliptic* $\mathcal{Q}$ $11^{\circ} 40'$. This is now the place of the Nonagesime Degree. To it add three Signs, and it makes $\mathcal{M}$ $11^{\circ} 4'$ for the Cusp of the Ascendant; which bring to the *Eastern* Horizon, and move the Brazen Meridian in the Notches of the Wooden Horizon, until the Nonagesime Degree (Sun's place) *Leo* $11^{\circ} 40'$ be elevated $16^{\circ} 22'$ upon the Quadrant of Altitude; then doth the North of the North Horizon cut the Meridian in $74^{\circ} 33'$, the Latitude of the place North.

2. For the Difference of Longitude.

The Globe standing elevated to the Latitude $74^{\circ} 33'$, as found above, mark the Sun's place in the *Ecliptic* *Leo* $11^{\circ} 40'$, bring that to the Meridian, and set the Index to 12 at Noon; then move the Globe, till the Index points at the given Hour at *London* 3 h. 49' P. M. The Degrees of the Equator now under the Brazen Meridian $191^{\circ} 24'$ are the Right Ascension of the Mid-Heaven at *London*; which mark with Chalk: Then to the Sun's Place $\mathcal{Q}$ $11^{\circ} 40'$ add three Signs, the Sum is $\mathcal{M}$ $11^{\circ} 40'$.

This Point of the *Ecliptic* doth not Ascend, [See Page 24] in that Latitude; for which reason the Globe cannot decide the Controversy.

4. To

4. To find the Place on the Globe, where the Sun is Centrally Eclipsed in the Meridian.

1. For the Latitude.

Given the Sun's place $\mathcal{R}$ $11^{\circ} 38'$, and the Altitude of the Nonagesime Degree $21^{\circ} 10'$, with the Nonagesime Degree $\mathcal{H}$ $23^{\circ} 26'$.

SOLUTION.

To the Place of the Nonagesime Degree add three Signs; the Sum is $\mathcal{R}$ $23^{\circ} 26'$, the Cusp of the Ascendant. Bring this to the Eastern Horizon, and move the Brazen Meridian in the Notches of the Wooden Horizon, until the place of the Nonagesime Degree $\mathcal{H}$ $23^{\circ} 26'$ cut the Quadrant of Altitude in $21^{\circ} 10'$; then doth the Northern Notch of the Horizon cut the Brazen Meridian in $86^{\circ} 34'$ North beyond the Pole for the Latitude of that place.

2. For the Difference of Longitude.

SOLUTION.

Bring London to the Meridian, and set the Index to the given time of the Eclipse 3 h. 18': Then move the Globe till the Index points at 12 at Noon.

Now the Degrees of the Equator under the Brazen Meridian are $49^{\circ} 32'$, which is the Longitude of the place to the West of London, where the Sun will be Centrally Eclipsed in the Meridian, and Latitude $86^{\circ} 34'$ North beyond the Pole.

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5. To find the Place where the Sun sets Centrally Eclipsed.

1. For the Latitude.

Given the Sun's Place α 11 degr. 41 min. the Apparent time 4 h. 15' P.M. and the Altitude of the Nonagesime Degree 11 degr. 39 min.

SOLUTION.

Because in this Case the Sun is setting, bring his Place *Leo* 11 degr. 41 min. to the Western Horizon; add three Signs to it, and you have the Place of the Nonagesime Degree m 11 degr. 41 min.

Then move the Brazen Meridian in the Notches of the Horizon, until you bring the Nonagesime Degree m 11 degr. 41 min. to be elevated upon the Quadrant of Altitude 11 degr. 39 min. equal to the Angle Orient: Then observe what Degree of the Brazen Meridian is cut by the Notch of the Wooden Horizon; for that is the Latitude, or Pole's Elevation sought, which in this Example is 56 degr. 35 min. North.

2. For the Difference of Longitude.

Bring the Sun's Place in the Ecliptic *Leo* 11 degr. 41 min. to the Brazen Meridian, and over the Sun's place make a Mark on the Meridian, the Globe being elevated to the given Latitude 56 degr. 25 min. North; bring *London* to the Meridian, and set the Index to the time of the Eclipse 4 h. 15' P.M. Move the Globe, till the Index point at 12 at Noon. Here stay it, and observe what Place lieth under the Mark made on the Meridian (for that is the place where the Sun is Vertical at the given time) which is the East End of *Hispaniola*. Bring this place to the Western Horizon, and the Degrees of the Equator.

Now.

Now, under the Meridian are $54^{\circ} 14'$, the Longitude East of *London*; the Place now in the Zenith is the *East Moscovia*, where the Sun will set *Centrally Eclipsed*.

6. To find the Place where the *Eclipse* ends at Sun-setting.

Given the Sun's Place $\Omega 11^{\circ} 45'$, the Apparent time at *London* 6 h, 8' 59" P. M. and the Altitude of the *Nonagesime Degree* $46^{\circ} 43'$.

1. For the Latitude of the Place.

Because the Sun is setting, bring his place in the *Ecliptic* $\Omega 11$ degr. 45 min. to the Western Horizon; add three Signs to it, and you have the place of the *Nonagesime Degree* $\mathcal{M} 11$ degr. 45 min.

Then move the Brazen Meridian in the Notches of the Wooden Horizon, until you bring the *Nonagesime Degree* $\mathcal{M} 11$ degr. 45 min. to be elevated upon the Quadrant of Altitude 46 degr. 43 min. equal to the Angle Orient, or Altitude of the *Nonagesime Degree*. Then observe what Degree of the Meridian is cut by the *Northern Notch* of the Wooden Horizon; for that is the Latitude or Poles Elevation sought, which in this Example is 25 degr. 48 min. *North*.

2. For the Difference of Longitude from *London*.

Bring the Sun's place in the *Ecliptic* $\Omega 11^{\circ} 45'$ to the Brazen Meridian, and there on the Meridian make a Mark. The Globe being elevated to the just now found Latitude 25 degr. 48 min. N. bring *London* to the Meridian, and set the Index to the time of the *Eclipse* 6 h. 8' P. M. Move the Globe back, till the Index point at 12 at Noon.

Here stay it, and observe what Degree of the *Equator* is under the Brazen Meridian; for that is the place where the Sun is Vertical at the given time, which is the *Gulph of Mexico* in *America*.

Bring

Bring this Place to the Western Horizon; and the Degree of the Equator then under the Meridian is $6^{\circ} 39'$ East Longitude from *London*. Now look upon the Zenith of the Globe, and you will find *Techort* in *Barbary*; at which place the Eclipse will end at Sun-setting.

Thus have I fully demonstrated by the Terrestrial Globe all the Appearances of this Solar Eclipse, which are all that can happen; because all the Penumbra doth not fall within the Earth's Disk. But in those Eclipses, when the Penumbra is all involved in the Disk, then there will be two more Cases (as in the Sun's Eclipse *December 28, 1730*,) that is, first, to find the Place where the Eclipse is at Sun-rising; and the other is, to find the Place where the Eclipse begins at Sun-setting. Of these in their Order.

1. To find by the Terrestrial Globe, the Place where the Sun's Eclipse of *Dec. 28, 1730*, ended at Sun rising.

	d.	h.	'	"
Given the Apparent Time at <i>London, Dec.</i>	28	21	25	34
Sun's Place	VS	17	43	0
Altitude of the <i>Nonagesime Degree</i>		90	48	0

1. For the Latitude of that Place.

SOLUTION.

Bring the Sun's Place in the Ecliptic VS 17 degr 43 min: to the Eastern Horizon (because the Sun is rising) and from it subtract three Signs, and you will have ≈ 17 degr. 43 min. for the Place of the *Nonagesime Degree*.

Then, because its Altitude is 90 degr. 48 min. from the North Part of the Horizon (because the Sum of the third Angle of Incidence 85 degr. 11 min. and the Angle of the Moon's Way 5 degr. 37 min. is more than a Quadrant) move the Brass Meridian in the Notches of the Wooden Horizon, until the Place of the *Nonagesime* ≈ 17 degr. 43 min. be elevated 90 degr. 48 min. from the North part of the Horizon, or 89 degr. 12 min. from the South part thereof; then the Degrees cut by the Southern Notch of the Horizon upon the Brass-

Brass-Meridian, are 7 degr. 41 min. which is the Latitude of the Place South.

2. For the Difference of Longitude from London.

The Globe being elevated to the Latitude of 7 degr. 41 min. South, just now found, bring the Sun's Place in the Ecliptic vs 17° 43', to the Brazen Meridian; make a Mark; then bring London to the Meridian, and set the Index to the time of the Eclipse 21 h. 26' P.M. Move the Globe, till the Index point at the upper 12, or Noon.

Now the Place on the Globe under the Meridian, which you mark'd, is the Sea betwixt the Kingdom of *Moniotapa* in South Africa and *Madagascar*. Here the Sun is Vertical at the given Time. Bring this Place to the Eastern Horizon (because the Sun is rising) and observe the Degrees of the Equator under the Meridian, which in this Example are 54 degr. 33 min. West Longitude from London.

Now, as the Globe stands, look on the Zenith, and you will see the Country of the Amazons in South America; to which place the Eclipse ends at Sun-rising.

This is the most Westerly Place that sees the Eclipse.

2. To find the Place on the Globe where the Eclipse begins at Sun-setting.

Given, the Apparent Time at London 22 h. 59 min. 38", the Sun's Place vs 17 degr. 47 min. and the Altitude of the Nonagesime Degree 79 degr. 34 min.

1. For the Latitude.

SOLU.

SOLUTION.

Bring the Sun's Place $\text{VS } 17^{\circ} 47'$ to the Western Horizon (because the Sun is setting) and to it add three Signs, and you will have $\gamma 17^{\circ} 47'$ for the Place of the *Nonagesime Degree*. Then, because its Altitude is 79 degr. 34 min. move the Brass Meridian in the Wooden Notches of the Horizon, until the Place of the *Nonagesime Degree* $\gamma 17^{\circ} 47'$ be elevated 79° 34' from the South Horizon.

Now, the Degrees cut by the *Northern Notch* of the Wooden Horizon, are 16 degr. 36 min. and such is the Latitude *North*.

2. For the Difference of Longitude.

The Globe being elevated to the Latitude 16 degr. 47 min. *North*, just now found, bring the Sun's Place in the Ecliptic $\text{VS } 17$ degr. 47 min. to the Brass Meridian, and there make a Mark exactly over the Sun's Place; then bring *London* to the Meridian, and set the Index to the time of the Eclipse 22 h. 59' 38" P.M. Move the Globe, till the Index points at 12 at Noon, the Place under the Mark on the Meridian, is the Western Coast of *Monapota* in South Africa. Here the Sun is Vertical at the given time.

Bring this Place to the Western Horizon (because the Sun is setting.) Here stay the Globe, and see what Degrees are on the Equator under the Mark on the Meridian; for they are the Longitude from *London*, and are 98 degr. 4 min. East.

Now look on the Zenith of the Globe, and you will see *Pagu* in the *East Indies*. This is the most Eastern Place that sees any thing of this Eclipse.

Because the Solution by the Terrestrial Globe, of finding the Places where the Sun is Centrally Eclipsed in the *Nonagesime Degree* is the most difficult, and my Design of Writing being to make all things plain to the meanest Capacity; therefore for the sake of my younger Readers, I will add another Example, which shall be of the Sun Centrally Eclipsed in the *Nonagesime Degree*, Anno 1730, December 27th, 22 h. 12' 42"; Sun's Place $\text{VS } 17^{\circ} 45'$, and the Altitude of the *Nonagesime Degree* $87^{\circ} 46'$.

SOLUTION.

1. For the Latitude of that Place.

Mark the Sun's Place in the Ecliptic $\vee$ 17 degr. 45 min. This is now the Place of the *Nonagesime Degree*,

To it add three Signs, and it makes $\vee$ 17 degr. 45 min. for the Cusp of the Ascendant; which bring to the Eastern Horizon: Keep it there, and move the Brass Meridian in the Notches of the Wooden Horizon, until the *Nonagesime Degree* (Sun's place) $\vee$ 17 degr. 45 min. be elevated upon the Quadrant of Altitude 87 degr. 46 min. from the South part of the Horizon; then doth the South Notch of the Horizon cut the Brass Meridian in 20 degr. 2 min. South, the Latitude sought.

2. For the Difference of Longitude.

The Globe standing elevated to the Latitude 20 degr. 2 min. South, mark the Sun's place in the Ecliptic $\vee$ 17 degr. 45 minutes, which bring to the Meridian, and set the Index to 12 at Noon; then move the Globe till the Index point at the given Hour 20 h. 13 min. at London, the Degrees of the Equator now under the Meridian 262 degr. 24 min. are the Right Ascension of the Mid-Heaven at London; which mark with Chalk. Then to the Sun's place add three Signs, the Sum is, $\vee$ 17^o 45'. Bring this to the Eastern Horizon, and here stay the Globe; the Degrees of the Equator now on the Meridian are the Right Ascension of the Mid-Heaven 286 degrees 55 minutes, the Place where the Sun is Centrally Eclipsed in the *Nonagesime Degree*; which mark in the Equator with Chalk: Also count the Degrees in the Equator between these two Chalks, and you will find them to be 26 degrees 30 minutes, the Difference of Longitude from London East; because the time at London was more than 12 Hours; when it is less than 12 Hours, then it is West.

How

How exceeding pleasant must it be to the young Astronomer, to take the Terrestrial Globe in his hand, and at one View to see the principal Appearances of any Solar Eclipse! This, I say, is very satisfactory, by reason he may examine the Calculations, and by that means find out the Faults, if any.

CHAP. XIX.

Shewing how to observe the Phases of Venus and Mercury.

HE that understands what I have already wrote in my *System of the Planets demonstrated*, cannot but rightly conceive the true System of the World, I mean, the Heavenly Bodies themselves, and how they move in their several Orbits: For, since all the Planets, as well as our Earth, are Spherical, Opaque and Scabrous, or rough uneven Bodies, they do reflect every way the Sun's Rays which fall upon them.

And it follows also from hence, that one half of every Planet (nearly) or that Hemisphere which is turned nearest the Sun, will be illuminated by him, and the other Hemisphere must remain in Darkness.

And because the Orbits of the two inferiour Planets *Venus* and *Mercury* are inscribed within the Earth's Orb, they increase and decrease in Light as our Moon doth: For when they are in Conjunction with the Sun in the upper part of their Orb, the same Face that they then shew to the Sun, is also turned to our Earth, which is full, except when they are in, or near the Nodes, and then they are behind the Sun, and consequently cannot be seen by a Spectator on our Earth; that is, if their Latitudes be less than the Sun's Semidiameter.

Such a Conjunction as this happen'd of the Sun and *Mercury*, Anno 1693, October 29, at 32' 50" past Noon in $16^{\circ} 52' 7''$, with Latitude $4^{\circ} 57''$ S. A.

This Conjunction, *J. Wing* put in his Almanack for that Year, with the Calculation, to shew the Passage of *Mercury* over the Sun's Disk. Indeed, if he could have jump'd into either *Saturn* or *Venus* at that time, he might then have seen *Mercury* as a black Spot in the Sun: For as *Mercury* was then in *Scorpio*, so were *Saturn* and *Venus* in *Sagittary*; so that an Eye from either of them might have seen *Mercury* in the Sun.

I mention this, only as a Caution to young Students, that they may not fall into the like Error, as he did.

In Page 426, of Vol. I. of my *System*, I have taught how to Calculate a Retrograde Conjunction of *Mercury* or *Venus* over the Sun: But because that differs something from a Direct Conjunction, it will not, I believe, be taken amiss if I shew here how it is to be done.

All the difference is, in finding the Distance of the Planet from the Earth, at the time of the true Conjunction: For as in the Retrograde Conjunction the Angle of the Sun is always 6 Signs; and the Distance of *Mercury* from the Sun is subtracted from the Distance of the Sun from the Earth; so in the Direct Conjunction the Angle at the Sun is nothing: The Distance of *Mercury* from the Sun is added to the Distance of the Sun from the Earth; and that Sum is the Distance of *Mercury* from the Earth; (the like in *Venus*.)

To make it more intelligible, take a Synopsis of the Calculation of the Conjunction above mentioned, as it happens from my Tables,

we and Mercury are infixed within the Earth's Disk: For increase and decrease in light as our Moon does: For when they are in Conjunction with the Sun in the upper part of their Orb, the same Face that they then shew to the Sun is also turned to our Earth which is full, except when they are in or near the Nodes, and then they are behind the Sun, and consequently cannot be seen by a Spectator on our Earth: that is, if their Latitudes be less than the Sun's.

Such a Conjunction as this happen'd of the Sun and Mercury on October 20. at 32° 30' past Noon in 1712. Equal

	d.	h.	'	"
Equal time of true Orbit $\odot$ 1693, October	29	0	32	50
Equation of time add			15	52
Apparent Time	29	0	48	42

	S. $\odot$ ' "	S. $\odot$ ' "
Mean Anomaly of	4 10 44 31	10 22 21 40
Mean Longitude	7 18 21 28	7 4 59 40
Prosthapheresis sub.	1 29 21	+ 11 52 27
Orbit Place	7 16 52 7	7 16 52 7
Mercury's North Node sub.	— — — —	1 14 42 12
Argument of Latitude	— — — —	6 2 9 55
Angle at the Sun	0 0 0 0	— — — —
Inclination of the Orb	— — — —	0 15 48

For the Latitude of *Mercury*.

Dist. $\odot$ à $\ominus$	98912"	4.995250
Dist. $\odot$ in his Orbit à $\odot$ add	45513	4.658138
Dist $\odot$ à $\ominus$	144425	5.159642
As Dist. $\odot$ à $\ominus$	144425	Co Ar. 4.840358
To Dist. $\odot$ à $\odot$	45513	4.658138
So $\angle$ Inclinat.	0° 15' 48"	7.662244
To $\angle$ Geocen. Lat. S.A.	0 4 57	7.160740

That my Reader may have a right Idea of these matters, I will give him another Example of the Conjunction of the Sun with *Venus* Direct, Anno 1735, when she will pass below the Sun 45' 16". See a Synopsis of the Calculation, and mark it well.

Equal time of the true Eclipt. of 1735, Jan.	d. h. ' "	8 21 8 0
Equation of time sub.		11 33
Apparent time		8 20 56 27

	S. ° ' "	S. ° ' "
Mean Anomaly of	6 20 54 37	11 22 49 49
Mean Longitude	9 29 14 52	9 29 54 16
Prosthapherefs add	0 42 20	0 5 56
Orbit Place	9 29 57 12	10 0 0 11
Venus's North Node	-- -- -- --	2 14 15 58
Argument of Latitude	-- -- -- --	7 15 44 14
Reduction sub.	-- -- -- --	3
Ecliptic Place	9 29 0 0	57 11 0 0
Angle at the Sun	0 0 0 0	-- -- -- --
Inclination of the Orb	-- -- -- --	2 25 34

For the Latitude of Venus.

Dist. ☉ à ☿	98423"	4.993098
Dist. ♀ à ☉ curtar. add	72183	4.858435
Dist. ♀ à ☿	170606	5.231994

As Dist. ♀ à ☿	170606 Co Ar.	4.768006
To Dist. ♀ à ☉	72183	4.858435
So ♀ Inclination	2° 25' 34"	8.627045
To ♀ Geocen. Lat. S.A.	1 1 37	8.253486
Sum Semidiam. sub.	16 21	

Venus below the Sun 45 16

Now

Now she shews a full Face to the Earth, which I shall call 12 Digits (as in the Luminaries;) and all the time from this, to her Retrograde Conjunction with the Sun, the Light will be decreasing, until she come to her Retrograde Conjunction; and then her dark Hemisphere being turned towards us, because now she is in a right Line, if the Sun be in her Node, or so near it, that her Latitude be less than the Sun's Semidiameter at that time, she will appear a black Spot in the Sun's Disk.

And from this Conjunction, to her Direct Conjunction again, she is encreasing in Light, is horned, bisected and gibbous, but on the reverse side to what she was before, in going from the Direct to the Retrograde Conjunction.

What I have here said of *Venus*, holds good also in *Mercury*. So, by understanding well what goes before, it is easy at all times to know what Phase or Face either of these Planets will put on before, or when you look at them: For subtract the Sun's Place from the Heliocentric Place of *Venus* or *Mercury*, and if the Distance be less than 90° , or three Signs; or more than six, or less than nine, say,

As Radius,

To 12 Digits;

So is the Co-Sine of half the Distance of the Planet from the Sun,

To the Digits and Decimal Parts of a Digit then light. See the Scheme in Page 66.

But if the Distance be more than three Signs, or less than nine, say,

As Radius,

To 12 Digits light;

So is the Sine of half the Distance of the Complement to 6 Signs,

To the Digits and Decimal Parts light.

A Table of the light Digits of Venus and Mercury.

Dift. ♀ & ☿ à ☉ S. °		Digits lighr.		Dift. ♀ & ☿ à ☉ S. °
0	0	12.		0 12
0	10	11.95		20
0	20	11.83		10
1	0	11.59		0 11
1	10	11.28		20
1	20	10.88		10
2	0	10.39		0 10
2	10	9.83		20
2	20	9.193		10
3	0	8.485		0 9
3	10	7.713		20
3	20	6.883		10
4	0	6.		0 8
4	10	5.027		20
4	20	4.104		10
5	0	3.105		0 7
5	10	2.094		20
5	20	1.046		10
6	0	0.		0 6

After

After this manner have I calculated the foregoing Table ; which shews, that in the first *Semicircle* of their Distance from the *Sun*, their Digits of Light decrease ; and in the other *Semicircle*, that is, from 6 to 12 *Signs* of their Distance from the *Sun*, the Light increaseth.

But here it is to be remember'd, that in the first *Semicircle* of their Distance from the *Sun*, they are Occident, and therefore may be observed in the Evening after Sun-set.

But if the Distance of the Planet be more than 6 *Signs*, then they are Orient, and consequently must be view'd in the Morning before Sun-rising.

But here we must take care that we be not deceiv'd by the general Consideration of her Phases only, so as to think that *Venus* will always appear bright and largest : For suppose the Earth at P, and *Venus* at Q in the first Triangle, Page 66 ; tho' *Venus* will then shine with a full Face ; yet she will be then so far from the Earth, that her Distance from us will more than compensate for the Quantity of her Light.

Wherefore you may expect to see her most bright and splendid about her greatest Elongations. See the Figure, Page 47.

And since her shining, or apparent Light increases in a duplicate Ratio ; or as the Square of her Distance from us diminishes, her Light will be much more increased by her Approach to the Earth, than it will be lessen'd by our seeing less of her illuminated Disk.

So that the Table above shews her true Light at such a Distance from the *Sun*, but will sometimes differ from the apparent Light, for the reason just now given.

Nothing remains now, but to shew how to observe the Phases of *Venus* and *Mercury* with a Telescope.

In order hereunto, you must be provided with a Telescope 14, 16 or 20 Foot, and be sure that the Glasses be well proportion'd to the length of the Tube.

Then you must provide an Aperture (which is a Word in Opticks) that is nothing else but a piece of fine Gard or Past-board cut round, just the bigness of the Object Glass, with a round Hole in its Center, about two tenths of an Inch Diameter, for a Glass 14 Foot long. Put this on the Inside of the Object Glass close to it, when you would observe the Phases of these Planets, and you will have your End answer'd.

Note,

Note, The Hole in the Pasteboard, or Aperture, is best made with a round hot Iron; otherwise it will be difficult to make the round.

Thro' this Hole in the Aperture the Image of the Object comes into the Tube, and thence is carry'd to the Eye.

Mr. *Auzout* saith, he found, that the Apertures of Telescopes ought to be nearly in a subduplicate proportion of their Lengths.

This is only a *French* Notion: For what he means, is best known to himself. This I can assure you, that the best way of fitting the Aperture to the Telescope, is by Trial; for a subduplicate Proportion is no more than as 2 to 4, or as 3 to 10, &c.

The visible Area of an Object is not increas'd or diminish'd by the greater or lesser Aperture of the Object Glass: All that is effected thereby, is the admittance of more or less Rays, and consequently the more bright or obscure Appearance of the Object.

When you look at *Venus* thro' a Telescope, you must use a much less Aperture than for the Moon, *Jupiter* or *Saturn*; because her Light is so Vivid and Glaring.

The Table that I have here given, with Practice is the only Guide you can have for proportioning an Aperture to your Telescope: For if the Observation agrees with the Table, according to the Planer's distance at that time from the Sun, then the Aperture and Telescope are rightly proportioned, else not; and so by Trials you must make it bigger or lesser, till you find a Concurrence.

Anno 1734, Feb. 28, at 6 Hours P.M. I observ'd *Venus* with my $13 \frac{1}{2}$ Foot Glass, and an Aperture as above describ'd, to have something more than 1 Digit and half Light.

Venus's Heliocentric Place was then 5 Signs, $6^{\circ} 11' 38''$, and the Sun's Place $118. 10^{\circ} 38' 36''$; her Distance from the Sun was $38. 15^{\circ} 13' 22''$, which in the Table gives 1.546 Digits light, agreeing exactly with Observation.

The Moon at the same time was in *III*, just past her *Perigeeum*, with 3.034 Digits increasing in Light.

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To

To be a Compleat Astronomer is the greatest Ornament that it's possible Man can be adorned with. Certainly nothing brings him nearer to his Creator, than to contemplate upon the Works of the Great *Jeboavh*. 'Tis indeed an *Herculean* Task to arrive at any tolerable Knowledge of the Fa-
brick of the Universe: But if he finds the inestimable Gem, it makes a sufficient Compensation for all his Time and Cost.

To understand the Site of the Earth and Sea, and to compute the true Distances upon the Terraqueous Globe, is very wonderful, useful and pleasant: But this is nothing to what pleasure the Heavens afford us; there is room to entertain the Minds of the boldest Thinkers: For what can be more satisfaction to the Astronomer, than to point out the Times and Places in the Heavens of a Conjunction, Eclipse, Comer, &c. and to shew on what part of the Globe they shall be most seen, and where not at all!

This, I say, is very astonishing to the Ignorant, and those unlearned in this sublime Study; but much more to those skill'd in this Science, to see how their Lines and Numbers agree with the Inequalities in the Planets Motions; which, by infallible Demonstration teacheth the Distances, Magnitude, Motions, and Appearances of all the Celestial Bodies. The truth of all this cannot be made more evident, than by my Schemes of the Appearances of the Satellites of *Jupiter*, which are now published, and sold by my self, and by all the Opticians in *London*; where any one that has but an ordinary Telescope, may be satisfied of the Truth hereof any Evening when *Jupiter* is Visible; for thereby you will see if any of the Circumjovials are wanting, which of them it is, and where it is, whether in the Shadow of *Jupiter*, or between your Eye and his Body.

This is a Work so exceeding useful, that not any one who useth a Telescope, ought to be without, and which will be published Annually, if I meet with Encouragement.

And here I think it will not be taken amiss, if I mention a Paragraph of Dr *Pemberton's*, in the 180th Page of a View of Sir *Isaac Newton's* Philosophy; because it possibly doth not fall into every one of my Reader's hands.

“ Upon

“ Upon this (says he) I think, it is not improper to menti-
 “ on a Reflection made by our Excellent Author (meaning
 “ Sir Isaac Newton) upon these small Inequalities in the Pla-
 “ nets Morions ; which contains under it a very strong Phi-
 “ losophical Argument against the Eternity of the World.
 “ It is this, That these Inequalities of the Planets must con-
 “ tinually increase by slow Degrees, till they render at
 “ length the present Frame of Nature unfit for the purposes
 “ it now serves. And a more convincing proof cannot be
 “ desir’d, against the present Constitution’s having existed
 “ from Eternity than this, that a certain Period of Years will
 “ bring it to an End”.

I am aware, this Thought of our Author’s has been repre-
 sented even as impious, and as no less than casting a Reflec-
 tion upon the Wisdom of the Author of Nature, for framing
 a perishable Work. But I think, so bold an Assertion ought
 to have been made with singular Caution. For if this Re-
 mark upon the increasing Irregularities of the Heavenly Mo-
 tions be true in Fact, as it really is, the Imputation must re-
 turn upon the Asserter, that this doth detract from the Di-
 vine Wisdom.

Certainly, we cannot pretend to know all the Omniscient
 Creator’s Purposes in making this World ; and therefore
 cannot undertake to determine how long he design’d it should
 last. And it is sufficient if it endures the time intended by
 the Author. The Body of every Animal shews the unlimi-
 ted Wisdom of its Creator no less ; nay, in many respects
 more, than the larger Frame of Nature ; and yet we see,
 they are all design’d to last but a small space of time.

CHAP.

CHAP. XX.

Shewing how to Construct Tables of the Angle Orient, or Altitude of the Nonagesime Degree of Latitude North or South.

FIRST, in any Latitude North, if *Aries* or *Libra* Ascend; the Altitude of the Nonagesime Degree, or Angle Orient is gained by adding or subtracting the Obliquity of the Ecliptic to, or from the Complement of the Latitude of the Place, which is ever equal to the Elevation of the Equinoctial.

EXAMPLE.

In the Latitude of one Degree North, what is the Altitude of the Nonagesime Degree, when *Aries* and *Libra* Ascend?

OPERATION.

Latitude North. 1° .	Complement	89 0
Obliquity of the Ecliptic sub. and add		23 29
Angle Orient when <i>Aries</i> Ascends		65 31
Sum		112 29
From a Semicircle		180 0
Angle Orient when <i>Libra</i> Ascends		67 31

EXAMPLE II.

In the Latitude of 20 Degrees, and *Aries* and *Libra* Ascending, what's the Angle Orient?

OPERATION.

	°	'
Latitude 20° , Complement	70	0
Obliquity of the Ecliptic sub. and add	23	29
Angle Orient when <i>Aries</i> Ascends	46	31
Sum	93	19
From a Semicircle	180	0
Angle Orient when <i>Libra</i> Ascends	86	31

EXAMPLE III.

In the Latitude of $66^{\circ} 31'$, and *Aries* and *Libra* Ascending, what are the Angles Orient?

OPERATION.

	°	'
Latitude $66^{\circ} 31'$, Complement	23	29
Obliquity of the Ecliptic sub. and add	23	29
Angle Orient when <i>Aries</i> Ascends	0	0 X.
Angle Orient when <i>Libra</i> Ascends	46	58 Z.

But when any other Degree of the *Ecliptic* Ascends, then it will require the Solution of an Oblique-angled Spheric Triangle; which I shall fully explain in the following Examples.

EXAMPLE I.

In the Latitude of $51^{\circ} 32'$ North, when the first Scruple of Π or $\approx$ Ascends, what is then the Altitude of the Nongesimal Degree?

EXAMPLE II.

In the Latitude of 20° Degrees and *Aries* and *Libra* Ascending, what are the Angles Orient?

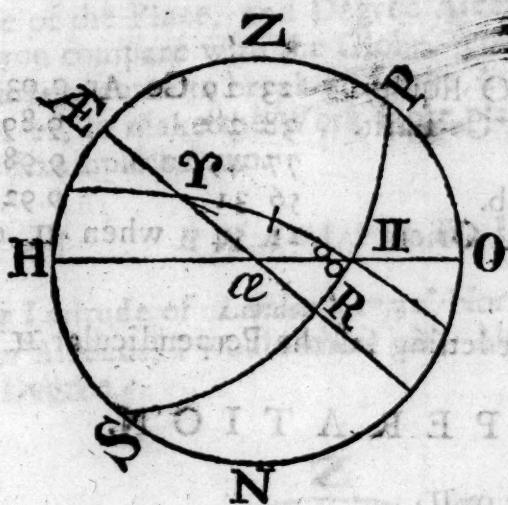
OPERA.

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As C. $\angle$
To Radius
So C.S. γ
To C. $\angle$

OPERATION.



In the adjacent Scheme, let the Circle HZON represent the Meridian of the Place, HO the Horizon, $\overline{AE}$ the Equinoctial, γ II a part of the *Ecliptic*, being 60 degr. thereof, the Angle α γ II, the Obliquity of the *Ecliptic* 23 deg. 29 min. and the Angle γ α II 141 degr. 32 min. the Complement of the Angle H α $\overline{AE}$ 38 degr. 28 min. the Elevation of the Equinoctial in the given Latitude of London 51 degr. 32 min. North; to find the Angle γ II α , equal to the Altitude of the Nonagesime Degree, or Angle Orient, which is formed by the *Ecliptic* γ II, and Horizon HO.

SOLUTION.

First, Let fall the Perpendicular II R, to cut the *Equinoctial* in R at Right Angles, and pass thro' its Poles at P and S. Then in the Right-angled Spheric Triangle γ R II,

As C. $\angle$ R γ II Obliquity	23 29	10.362044
To Radius	90 0	10.000000
So C. γ II in the <i>Ecliptic</i>	60 0	9.698970
To C. $\angle$ γ II R	77 45	9.336926

Secondly

OPERATION

Secondly,

As C.S. $\angle R \gamma \Pi$ Obliquity	23 29	Co. Ar.	0.037547
To C.S. $\angle \gamma \alpha \Pi$ Co-Latit.	38 28		9.893645
So S. $\angle \gamma \Pi R$	77 45		9.989997
To S. $\angle \alpha \Pi R$ sub.	56 31		9.921189
Rem. $\angle \gamma \Pi \alpha \angle$ Orient	21 54	when Π or $\approx$ A.	(icends.

Secondly Without letting fall the Perpendicular ΠR .

OPERATION

To find the Side $\alpha \Pi$.

As S. $\angle \gamma \alpha \Pi$ Co Latitude	38 28	Co Ar.	0.206168
To S. Cr. $\gamma \Pi$ in the Ecliptic	60 0		9.937531
So S. $\angle \alpha \gamma \Pi$ Obliquity	23 29		9.600409
To S. Cr. $\alpha \Pi$ in the Horizon	33 42		9.744108
Side $\gamma \Pi$	60 0		
Difference 26 18	Sides $\gamma \Pi$ 60 0	$\gamma \alpha \Pi$ 141 32	
Half 13 9			
Sum	93 42	$\alpha \gamma \Pi$ 23 29	
Half	46 51		
		X	118 3
		Half	59 1 1/2

Now say,

As S. half X crs. $\gamma \Pi$ & $\alpha \Pi$	13 9	Co Ar.	0.643016
To S. half Z	46 51		9.863064
So r. half X of $\angle \gamma \Pi$	59 1 1/2		10.221513
To C. half reqd. $\angle \gamma \Pi \alpha$	10 37		10.727593
Doubled, is $\angle \gamma \Pi \alpha$	21 14	Angle Orient, as before.	

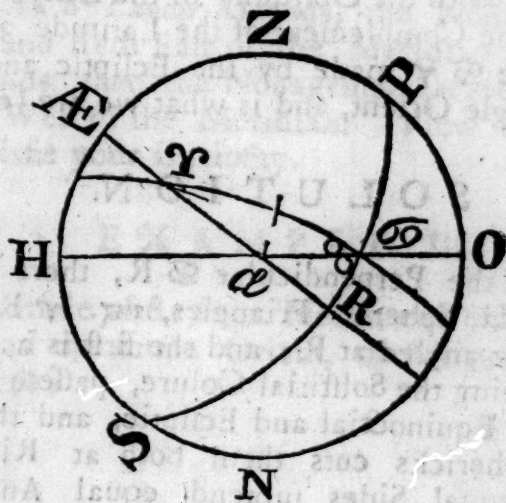
The

The same method of Solution has been observ'd in framing the following Tables, having particular regard to the Latitude of the Place, and Degree Ascending: Which Tables if you compare with the Globe, you will there see how the Numbers come to break off in the Artic Circle, &c.

However, to make the Work more plain, I shall here add another Example or two.

EXAMPLE II:

In the Latitude of *London* $51^{\circ} 32'$ North, when *Cancer* or *Capricorn* Ascends, I would know the Altitude of the Nonagesime Degree?



PROJECTION.

With the Chord of 60 degr. draw the Primitive Circle, which shall here represent the Meridian of the Place.

Quarter it, and draw HO for the Horizon, Z for the Zenith, and N for the Nadir. Because the Amplitude at *London* in *Cancer* and *Capricorn* is 39 degr. 50 min. take the Semi-Tangent thereof, and set it from α to 6; then take the Chord of 51 degr. 32 min. and set it on the Meridian from O to P, and from H to S; so shall P be the North Pole, and S the South.

U

To

To the three Points P $\odot$ and S find a Center, and draw the Hour-Circle P $\odot$ S; make Z $\hat{A}$ = to OP, the Latitude of London, and draw $\hat{A} \propto R$ for the Equinoctial.

Then because the Oblique Ascension of the Ascendant at London is 56 degr. 51 min. when Cancer Ascends, from $\hat{A} \propto$ a Quadrant = 90 degr. subtract the Oblique Ascension 56 degr. 51 min. from 90 degr. and the Remainder 33 degr. 9 min. is the Distance of γ from the Meridian $\hat{A}$.

Therefore take the Secant of 33 degr. 9 min. and draw the Vertical Circle Z γ N; the Oblique Circle P $\odot$ S is also the Solstitial Colure, and cuts the Ecliptic $\gamma \odot$ at Right Angles in $\odot$, and the Equinoctial in Right Angles in R.

Therefore in the Oblique-angled Spheric Triangle $\gamma \odot \propto$ there are known $\gamma \odot$, a Quadrant or 90° , the Angle $\propto \gamma \odot 23^\circ 29' =$ to the Obliquity of the Ecliptic, and the Angle $\gamma \propto \odot$ the Complement of the Latitude $38^\circ 28'$, to find the Angle $\propto \odot \gamma$ made by the Ecliptic and Horizon, which is the Angle Orient, and is what we are seeking.

SOLUTION.

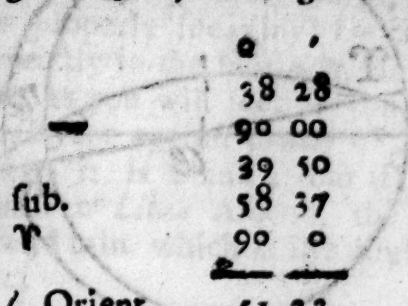
By letting fall the Perpendicular $\odot R$, there are form'd two Right angled Spheric Triangles, viz. $\gamma R \odot$, and $\propto R \odot$, both Right-angled at R; and the first is a Quadrant; because R $\odot$ being the Solstitial Colure, passeth thro' both the Poles of the Equinoctial and Ecliptic, and therefore by the Laws of Sphericks cuts them both at Right Angles And because equal Sides subtend equal Angles, therefore γR is also a Quadrant; for Triangles, mutually equal in themselves, are also equiangular.

1. To find $\propto \odot$.

As S. $\gamma \propto \odot$ Elevat. Equinoct.	38 28	9.793832
To S. $\gamma \odot$ Longitude	99 0	10.000000
So S. $\angle \propto \gamma \odot$ Obliquity	23 29	9.600409
To S. $\propto \odot$ in Horizon = Amplir.	39 50	9.806577

Now;

Now in the Right angled Spheric Triangle $\alpha \gamma \delta$ there are given, the Angle $R \alpha \delta = 38^{\circ} 28'$ the Elevation of the Equinoctial, and $\alpha \delta$ the Amplitude in the Horizon $39^{\circ} 50'$, to find the Angle $\alpha \delta R$, the Angle Orient.



As C. $\angle R \alpha \delta$	38 28	10.099913
To Radius	90 00	10.000000
So $\alpha \delta$	39 50	9.885311
To C. $\angle \alpha \delta R$ sub.	58 37	9.785398
From the $\angle R \alpha \delta \gamma$	90 0	
Rem. $\angle \alpha \delta \gamma \angle$ Orient	51 23	

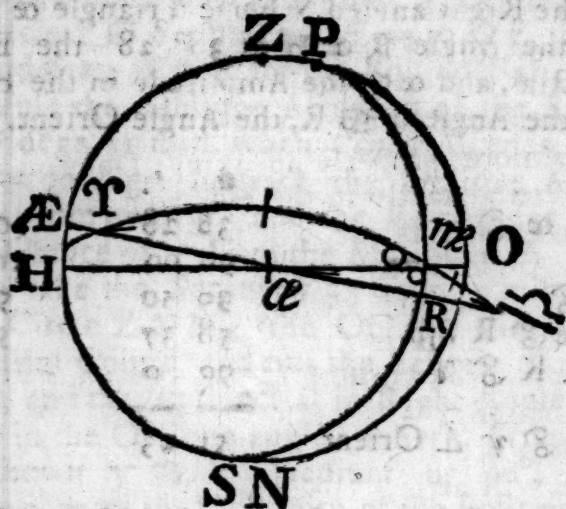
Note, When 0° Cancer Ascends, the Nonagesime Degree is in $\gamma 0^{\circ}$, and lieth East of the Meridian; but when Capricorn Ascends, then the Nonagesime Degree is *Libra*, and lieth to the West of the Meridian. View the Globe, and that will satisfie your Curiosity.

EXAMPLE III.

In the Latitude of 81 degr. North, and 9 degr. Υ Ascending, I demand the Angle Orient, or Altitude of the Nonagesime Degree?

U 2

L



In this Scheme, in the Triangle $\alpha \mu \zeta$, let the Perpendicular be an Hour-Circle $P \mu S$, to cut the Equinoctial at Right Angles in R.

Then in the Rect angled Triangle $\triangle R \triangle$ are known
 $\angle R \triangle = 21$ degr and the Angle at $\triangle = 23$ degr. 29 min. to find
the Angle R $\angle R \triangle$.

A. C. $\angle$ $\pi \rightarrow$ R Obliquity	23 29	10 362044
To Radius	90 00	10.0000000
So C S. $\pi \rightarrow$ Longitude	21 0	9.970155
To C. $\angle$ R $\pi \rightarrow$	67 55	9.680111

Then say, By the Homogeneal Parts,

As C.S. $\angle$ R Obliquity	23 29	Co Ar.	0.037547
To C.S. $\angle$ R Co Latir.	9 0		9.994620
So S $\angle$ R last found	67 55		9.966910
To S. $\angle$ R	86 16		9.999077
Add $\angle$ R	67 55		
Z = $\angle$ R sub.	154 11		
From —	180 0		
Rem. $\angle$ R $\angle$ Orient	25 49		

It

It may also be solved in the Triangle $\gamma \mu \alpha$.

In the Latitude of 66 degr. 31 min. North, and 0° *Cancer* Ascending (or more properly speaking) Descending, the Ecliptic Circle lieth exactly in the Horizon, and consequently hath no Elevation; as you will see, if you look into the Tables of the Angle Orient against *Cancer* 0° , and under Latitude 66 degr. 31 min. it is blank; but if you move the Globe Westward, until 0° *Libra* Ascend, the Angle Orient will be then 46 degr. 58 min. which is the double of the Obliquity of the Ecliptic.

From which it is plain, that within the Polar Circles some doubtful Cases will arise; because a great part of the Ecliptic doth Ascend in a Moment of time.

As, for instance; In the Altitude of 67 degr. 37 min. North, let *Cancer* 22 degr. 17 min Ascend, the Angle Orient will be 15 degr. 13 min.; and when *Capricorn* 22 degr. 17 min. Ascends, the same Angle will be 3 degr. 29 min. In the first Case, the first Point of *Cancer* never sets; and in the latter, the first Point of *Capricorn* never rises.

But let the South Pole be Elevated, as before, and the Ascendant the same, viz. *Cancer* 22 degr. 17 min. then the Angle Orient is 3 degr. 29 min. and *Cancer* never rises. But if *Capricorn* 22 degr. 17 min. Ascend, the Angle Orient is 15 degr. 13 min. and the first Point of *Capricorn* never sets, as is made more plain in the following Work.

EXAMPLE.

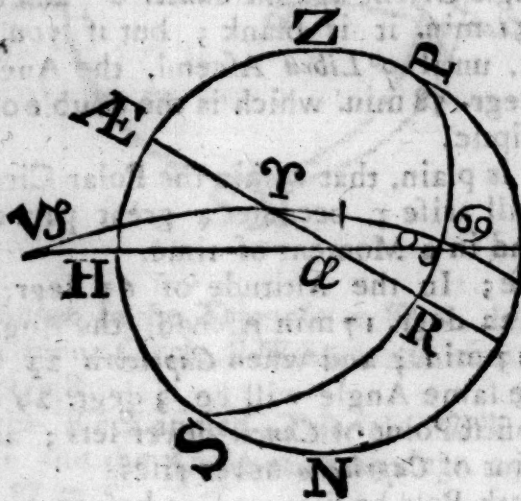
Latitude 67 degr. 37 min. North, Ascendant *Cancer* 22 degr. 17 min. what's the Angle Orient?

U 3

OPE.

OPERATION.

In the Oblique-angled Spheric Triangle $\gamma \alpha \zeta$, the Angle is Obtuse, and therefore doubtful.

As $C. \angle \alpha \gamma \zeta$

23 29

10.361044

As Radius

90 00

10.000000

So $C. S. \gamma \zeta$

67 43

9.578853

To $C. \angle \gamma \zeta R$

80 39

9.216809

From

180 0

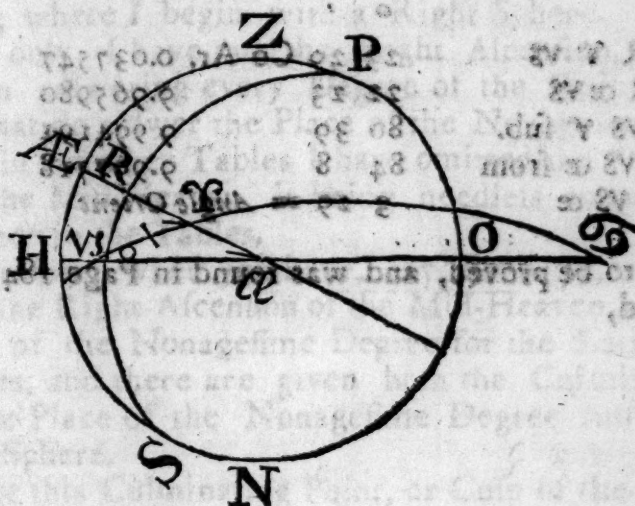
 $\angle \gamma \zeta R$

99 21

Now say,

As C.S. R γ $\odot$	23 29	Co A. 0.037547
To C.S. γ $\odot$	22 23	9.965980
So S. γ $\odot$ R	80 39	9.994198
To S. α $\odot$ R	84 8	9.997718
From $\angle$ γ $\odot$ R	99 21	
$\angle$ γ $\odot$ α	15 13	Angle Orient.

Secondly, In the same Latitude of $67^{\circ} 37'$ North, let Capricorn $22^{\circ} 17'$ Ascend; then what's the Angle Orient?



In the Oblique-angled Spherical Triangle $RV\alpha$, the Angle $R V \alpha$ is Acute.

U 4

OPE.

OPERATION.

As C.s. $\angle$ R $\forall$ S	23 29	10.362044
To Radius	90 00	10.000000
So C.S. $\forall$ S $\forall$	67 43	9.578853
To C.s. $\angle$ R $\forall$ S $\forall$	80 39	9.216809

Now, if the Perpendicular $\forall$ S R be compared with the Angles at $\forall$ S and $\forall$, and at α , they will be opposite Extrems

As C.S. $\angle$ R $\forall$ S	23 29	Co Ar. 0.037547
To C.s. $\angle$ R α $\forall$ S	22 23	9.965980
So S. $\angle$ R $\forall$ S $\forall$ sub.	80 39	9.994191
To S. $\angle$ R $\forall$ S α from	84 8	9.997718
Rem. $\angle$ $\forall$ $\forall$ S α	3 29	= Angle Orient

Which was to be proved, and was found in Page 184, by my new Method,

CHAP.

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C H A P. XXI.

The Explanation and Use of the following Tables.

1. **T**HE Tables of the Nonagesime Degree are made by the 34th Problem of my *Compleat System*; by which Tables the Nonagesime Degree may be found to any Time and Latitude, as mentioned on the Top, or Head of each Table; where I begin with a Right Sphere. And in that Table only, I have put the Right Ascension of the Mid-Heaven answering every Degree of the Ecliptic; and to those that do answer the Place of the Nonagesime Degree.

But in the other Tables I have omitted the Right Ascension of the Mid-Heaven, it being needless to repeat it more than once in the Tables.

Therefore, when you have, (by Prob. 27, of my *System*) found the Right Ascension of the Mid-Heaven, seek it in the Table of the Nonagesime Degree for the Latitude of No Degrees, and there are given both the Culminating Point, and the Place of the Nonagesime Degree answering in a Right Sphere.

Take this Culminating Point, or Cusp of the tenth House, and with it enter the Table of the Nonagesime Degree in the Latitude you intended, and there is the Place of the Nonagesime Degree for the Time and Latitude propos'd.

E X A M P L E.

Anno 1731, July 10, at 7 in the Evening, in the Latitude of 53 Degrees 22 Minutes North, I demand the Place of the Nonagesime Degree?

	°	'	"
Sun's Place then from my Tables	28	20	14
Sun's Right Ascension	120	27	0
Time from Noon	105	0	0
Sum, <i>R. A. M. Cali</i>	225	27	0

Now,

Now, With the Right Ascension of the Mid-Heaven 221 degr. 27 min. enter the first Table of the Nonagesime Degree, and there take out the Cusp of the Tenth answering (ever minding to take the proportional Part for the odd Minutes) which I here find to be *Scorpio* 17 degr. 55 min.

With this I enter the Table for the Latitude 53 degr. 21 min. and there it gives me the Place of the Nonagesime Degree *Libra* 9° 31'.

Note, These Tables are calculated for North Latitudes only; but they may be made Universal, by entering the Tables with the opposite Sign and Degree of the Cusp of the Tenth, and there are given the opposite Sign, Degree and Minutes of the Place of the Nonagesime Degree.

Only observe, that when the very beginning of the two Tropical Signs Culminate, that then you must not enter the Tables with their Opposites, but with those Signs themselves, and the Degrees answering, is the Place of the Nonagesime Degree, as it is titled in the *Tables*.

EXAMPLE.

In the Latitude of 51 Degrees South, I desire to know the Place of the Nonagesime Degree, when the beginning of every one of the 12 Signs Culminate?

EXAMPLE.

June 1731, July 10, at 7 in the Evening, in the Latitude of 53 Degrees 21 Minutes North, I demand the Place of the Nonagesime Degree?

221	27	0
107	0	0
120	27	0
22	27	0

Signs
Sun's Place then from my Table
Sun's Right Ascension
Time from Noon
Sun, R. A. M. Cus

Signs on the Meridian.

γ
 δ
 ε
 69
 ζ
 η
 θ
 ι
 κ
 λ
 μ
 ν
 ο
 π
 ρ
 σ
 τ
 υ
 φ
 χ
 ψ
 ω
 ♀
 ♂

Then the Nonagesime
Degree is

0
 1
 ♀ 3 46
 ♂ 25 51
 γ 7 57
 69 0 0
 η 2 3
 θ 4 9
 ι 26 14
 κ 16 12
 λ 7 13
 μ 0 0
 ν 22 47
 ο 13 48

Here you see when *Aries* Culminates, I enter the Table with *Libra*, and there is given ♀ 3° 46'; but I do not write *Virgo*, but its opposite Sign *Pisces*, and so of the rest, as in the Example above.

Note, The Altitude of the Nonagesime Degree is always equal to the Distance between the Zenith and the Pole of the Ecliptic.

To the Place of the Nonagesime Degree *Libra* 9° 31' above found, add three Signs, and it makes *Capricorn* 9° 31' for the Cusp of the Ascendant; with which, and the Latitude of the Place on the Head of the Table of the Angle Orient, is given the Altitude of the Nonagesime Degree.

EXAMPLE.

Let the Ascendant be *Capricorn* 9° 31' (as above) and the Elevation of the Pole 53° 22' North. I demand the Altitude of the Nonagesime Degree?

Find the Ascendant in the first Column on the Right Hand, and go streight towards the Left, till you come under the Latitude 53° on the Head, and in the Place of Meeting are given 25° 7', the Altitude of the Nonagesime Degree.

But because the Tables are Calculated to even Degrees only, you must always mind to make proportion for the odd Minutes, both for the Latitude and Ascendant.

And .

And so on the contrary; when the *Ascendant* and *Altitude* of the *Nonagesime Degree* are given, the *Latitude* of the Place answering is given in the *Tables*, as I have fully exemplify'd in other places of this Book, where I treat of Solar Eclipses.

Note, These *Tables* are also calculated for North Latitudes. Therefore to use them in South Latitudes, you must enter the Side with the opposite Sign *Ascending*; and in the Given Latitude is the *Altitude* of the *Nonagesime Degree*.

But when either the first Minute of *Cancer* or *Capricorn* *Ascends*, it matters not whether you take the true *Ascendant*, or its Opposite; for they will both give you the same true *Altitude* of the *Nonagesime Degree*; for in both Cases, the *Equinoctial Points* are the Places of the *Nonagesime Degree*; consequently, the *Altitude* of the *Nonagesime* is the same when the *Ascendant* is either *Cancer* or *Capricorn*; because the *Equator* is unalterable in the same Latitude.

So in the Latitude of 53° South and North, and the *Ascendant* *Capricorn* or *Cancer*, the *Altitude* of the *Nonagesime Degree* is $29^{\circ} 25'$; and in the Latitude of 53° North, and *Ascendant* *Gemini* 0° , the *Altitude* of the *Nonagesime Degree* is $19^{\circ} 25'$; but the same *Ascendant* *Gemini* 0° and 53° South Latitude, the *Altitude* of the *Nonagesime Degree* is $43^{\circ} 55'$; because then I enter the Table with the Opposite *Ascendant*, viz *Sagittary* 0° .

For further satisfaction herein, I refer you to the *Construction* of the *Tables* themselves.

3. The next is a correct Table of *Refractions* of the Sun, Moon and Stars, calculated by that great Mathematician Sir *Isaac Newton*; (for the *Laws* of *Refractions* I refer you to my *System*, under that Word.) He makes the *Horizontal Refraction* more by $45''$ than Mr. *Flamsteed* doth; and the *French Astronomers* make it $1'$ less at *Paris*, than he did at *Greenwich*.

But as it falls out to be so little, that none but nice Instruments can perceive its Effects, it was not discover'd to be at all, till *Barnardo Walther's* time, who was a Native of *Norimberg*, and flourish'd in the Year 1491, Disciple to *Regiomonta-*

nus.

nus. See *Marcus Manilius, Fol. 43.* The Curve which a Beam of Light describes, as it approaches the Earth, is one of the most perplex'd and intricate that can be propos'd.

As the Altitudes of the Stars, &c. are rais'd by the Refraction (as *per Table*) so their Distances from each other are contracted in whatsoever Position they are taken, *viz.* 1" in every Degree of Distance when they are in the Horizon; so that the Distance, for Example, of 30° loses but 30" in an Horizontal Site.

But if the one Star be 30, and the other 60 degr. high, the true Distance 30 degr. will appear to be only 29 degr. 59 min. But if one be 20 degr. high, and the other 50 degr. high, it will be lessen'd by above three times as much, or by 1' 41", the Difference still decreasing, as the Objects are more Elevated above the Horizon. *Phil. Transf. N^o. 368*

4. The Fourth is a Table of the Moon's Parallax in Altitude, which by the Horizontal Parallax on the Head, and the Moon's Altitude in the first Column on the Left hand, and where they meet, is the Moon's Parallax in Altitude at that time, which always makes the Moon's true Altitude so much less, as is her Parallax.

This Table I calculated by *Prob 38*, of my *System*.

5. The Fifth is a Table of the Moon's Parallax in Longitude and Latitude, which on the Head begins with 1', and runs to 62', being the Moon's Horizontal Parallax to serve for this purpose.

And the first Column on the Left hand, is in finding the Parallax in Longitude, the Distance of the Moon from the Nonagesime Degree. But in finding the Parallax in Latitude, the Numbers in the first Column are the Complement of the Altitude of the Nonagesime Degree.

The

The Table is thus made :

Admit the Moon's Horizontal Parallax be 56', and the Altitude of the Nonagesime Degree 30°, what Number in the Table must answer them ?

OPERATION.

Moon's Horizontal Parallax LL	°	56	LL	9.970040
Altir. of Nonagesime Degree S.	°	30	Sine	9.698970
Answering in the Table	°	28	LL	9.669010

USE.

The Table of the Moon's Parallaxes is of excellent use in determining the Quantity of any Solar Eclipse to any particular Place on the Earth, as I will shew anon.

1. For the Parallax in Longitude.

Enter the Table with the Moon's Horizontal Parallax on the Head, and the Altitude of the Nonagesime Degree in the first Column on the Left hand, and in the common Angle, or Place of meeting, is a Number which I call the *Horizontal Parallax in Longitude*.

Then with the Distance of the Moon from the Nonagesime Degree in the first Column on the Left hand, and the Horizontal Parallax of Longitude on the Head, gives the Parallax of the Moon in Longitude.

EXAM.

EXAMPLE.

Let the Horizontal Parallax of the Moon be $56'$, the *Altitude* of the *Nonagesime Degree* 30° , and the Distance of the Moon from the *Nonagesime Degree* 72° : What's the Parallax of the Moon in Longitude?

Moon's Horizontal Parallax	0	56	} Gives $28'$.
Altitude Nonages. Degree	30	00	

Then,

Horiz. Parall.) in Longitude	0	28	} Gives $26' 38''$, the
Dist.) from Nonag. Degree	72	00	
			(Moon in Longitude.

2. For the Parallax of the Moon in Latitude.

Enter the Table on the Head with the Horizontal Parallax of the Moon, and the first Column on the Left hand, with Complement of the *Altitude* of the *Nonagesime Degree*; and in the Place or meeting is the true Parallax of the Moon in Latitude.

EXAMPLE.

Admit the Horizontal Parallax of the Moon, and the *Altitude* of the *Nonagesime Degree* be as before: What's the Parallax of the Moon in *Altitude*?

Horizontal Parallax of the Moon	0	56	} Parallax Latit.
Alt. Nonag. Degn. 72° , Complement.	18	00	
			$17' 18''$.

Because the Tables are calculated to even Minutes of Horizontal Parallax, and to even Degrees of the *Altitude* of the *Nonagesime Degree*, &c. when they contain Degrees, Minutes and Seconds, you must mind to make proportion for the Minutes and Seconds, as in the following

EXAM-

EXAMPLE.

	0	'	"
Let the Horizontal Parallax of the ☾ be	0	60	15
Altitude of the Nonagesime Degree	50	33	0
Distance of ☾ from the Nonagesime	34	1	0

What is the Parallax of the Moon in Longitude and Latitude?

OPERATION.

	0	'	"
Moon's Horizontal Parallax	1	0	15
Altitude Nonagesime Degree	50	33	0
} Gives 46' 31"			

Then,

	0	'	"
Horizontal Parallax ☾'s Longitude	0	46	31
Dist. ☾ from Nonagesime Degree	34	1	0
} Gives 26' 1"			
			Par.
			Long.

Secondly,

	0	'	"
Horizontal Parallax of the Moon	1	0	15
Alt. Nonages. 50° 33' Complem.	39	27	0
} Parall. Lat. 38' 17"			

6. Shewing how to examine the Quantity of any Solar Eclipse in any Place on the Globe.

To the Time of the Visible Conjunction, find the Moon's Horizontal Parallax and True Latitude; which note down.

Then to that Time, and the Given Latitude, find the Nonagesime Degree and its Altitude.

Take the Difference between the Place of the Moon, and the Place of the Nonagesime Degree, and with these find the Moon's Parallax in Latitude.

Apply

Apply this as the Case requires, to the true Latitude of the Moon, and by it you will plainly see the Quantity of the Sun's Eclipse in that Latitude.

EXAMPLE.

Let it be required to find the Quantity of the Sun's Eclipse that happen'd Anno 1733, May 2, in the Northern Parts of Scotland, which lies in the Latitude of 59 Degrees North?

OPERATION.

By a former Calculation of mine the time of the

	d.	h.	'	"
Visible Conjunction at London is May	2	6	35	39
Difference of Meridians sub.			20	0
Visible ☿ near Faro Head in Scotland	2	6	15	39
Equation of Time sub.			4	6
Sun's Place then from my Tables	♄	22	52	27
Sun's Right Ascension		50	27	0
Time from Noon add		93	54	45
Sum, is the Right Ascension M. Calis		1144	21	45
Cusp of the Tenth	♈	21	59	0
Nonagesime Degr. in Lat. 59° North	♈	4	11	0
Sun's Place sub.	♄	22	52	0
Dist. of ☉ and ☿ from Nonagesime	2	11	19	0
Horizontal Parallax of the Moon		1	0	8
Ascendant	♊	4	11	0
Altitude of the Nonagesime Degree		48	12	0
Complement		41	48	0
Parallax of Longitude of the Moon		0	42	27
Parallax of Latitude of the Moon		0	40	5
Moon's true Latitude N. D.	•	43	16	
Visible Latitude of the Moon N.D.		3	11	
Sum of the Semidiameters of Sun and Moon		32	41	
Parts deficient		29	30	
Digits Eclipsed are on the upper side	11	1	0	

Secondly, I would know how the same Eclipse will appear at the Island of *Jamaica*?

O P E R A T I O N.

	d.	h.	'	"
Visible Conjunction at <i>London</i> , May	2	6	35	39
Difference of Meridians sub.		5	4	0
Visible Conjunction at <i>Jamaica</i>	2	1	31	39
Sun's true Place then from my Tables	♊	22	52	27
Sun's Right Ascension		50	27	0
Apparent Time from Noon at <i>Jamaica</i> add		22	54	45
Right Ascension <i>M. Cali</i>		73	21	45
<i>M. Cali</i> in the Ecliptic, Cusp 10th	II	14	41	0
Nonag. Degree in Latitude 18° North	II	14	8	0
Sun's Place sub.	♊	22	52	27
Dist. of Luminaries from Nonag. Degree		21	16	0
Horizontal Parallax of the Moon		1	0	8
Ascendant	♊	14	8	0
Altitude of the Nonagesime Degree		85	26	0
Complement		4	34	0
Parallax of Longitude of the Moon		21	44	
Parallax of Latitude of the Moon		4	47	
Moon's true Latitude N. D.		43	16	
Visible Latitude of the Moon		38	29	
Sum of the Semid. of the Sun and Moon		32	41	

Hence

Hence, because the Visible Latitude of the Moon at the time of the Visible Conjunction of the Sun and Moon exceeds the Sum of their Semidiameters, proves, that there will not be any Eclipse at all at the Place above-mentioned.

After the same manner may the Quantity of any other Solar Eclipse be nearly determin'd at any Place on the Globe.

But here I must remind my Reader, that the times of the Visible Conjunctions at these two Places are not truly found by subtracting the Difference of Meridians from the Time of the Visible Conjunction at *London*, as is there done; because the Parallaxes of the Moon in Longitude (on which the Visible Conjunction depends) are not the same that they are at *London*. But however, this Method is sufficient to try whether or no an Eclipse of the Sun will be seen at such a Place; and if Visible, what part of the Sun's Body shall be obscur'd, and (nearly) how much.

Also, if you reckon 184 Miles North and South, from the Parallel of *London*, you will nearly have one Digit to be added or subtracted to or from the Quantity of the Sun's Eclipse at *London*, counting 69.5 Miles to one Degree on the Earth's Surface.

These I propose as an Estimate, and not for perfect Truths; because the Moon's Parallax in Latitude, on which the Quantity of the Sun's Eclipse depends, is in a continual Flux; and therefore a particular Calculation to any Place is what only is perfect.

C H A P. XXIII.

An Abstract of an Act of Parliament, which Offers a Reward for the Discovery of the Longitude at Sea.

1. Stat. 12. Annæ, Sess. 2. Chap. 15.

ENacted, That the Lord High Admiral of *England*, or the first Commissioner of the Admiralty, the Speaker of the House of Commons, the first Commissioner of the Navy, the first Commissioner of Trade, the Admirals of the Red, White and Blue Squadrons, the Master of *Trinity-House*, the President of the Royal Society, the Royal Astronomer of *Greenwich*, the *Savilian*, and *Lucasian* Professors of the Mathematicks in *Oxford* and *Cambridge*, all for the time being; the Right Honourable *Thomas* Earl of *Pembroke* and *Montgomery*; *Philip*, Lord Bishop of *Hereford*; *George* Lord Bishop of *Bristol*; *Thomas* Lord *Trevor*; Sir. *Thomas* *Hanmer*, Baronet, Speaker, &c. *Francis* *Roberts*, *James* *Stanhope*, *William* *Clayton* and *William* *Lowndes*, Esqrs. shall be Commissioners for discovering the Longitude at Sea, and for examining all Proposals relating to it; and that any five of them may receive Proposals for that purpose, and if they be satisfied of the probability of such Discovery, they shall certify it to the Commissioners of the Navy, with the Author's Name; and on producing such Certificate, the Commissioners of the Navy shall make Bills for any Sum not exceeding 2000 *l.* as they shall think fit, for making the Experiment, payable by the Treasurer of the Navy, who shall pay it immediately out of any Money unapply'd, for the use of the Navy.

2. After

2. After the Experiment is made, the Commissioners appointed by this Act shall determine how far, and to what Degree of Exactness 'tis practicable.

3. The first Discoverer of a Method for finding the Longitude shall be entituled to a Reward of 10000 *l.* if it determines the same to one Degree of a great Circle, or 60 Geographical Miles; and to 15000 *l.* if it determines the same to two thirds of that distance; and to 20000 *l.* if it determines the same to one half of that Distance; and one half of such Reward shall be paid when the Major part of the Commissioners agree, that such Method extends to the Security of Ships within 80 Geographical Miles of the Shore, which are Places of the greatest Danger; and the other half, when a Ship, by the appointment of the Commissioners, shall Sail over the Ocean from *Great Britain* to any part in the *West-Indies* which they shall nominate for the Experiment, without losing their Longitude beyond the Limits mentioned.

As soon as such Methods shall be tried and found practicable at Sea, within any the Degrees aforesaid, the Commissioners shall Certifie the same to the Commissioners of the Navy, with the Author's Name, and on such Certificate the Commissioners shall make out a Bill for the respective Sums to which the Author shall be entituled, and to be paid by the Treasurer of the Navy.

This *Act* has encouraged many to bend their Thoughts towards the Discovery of the Longitude at Sea.

The Names of such as are come to hand, with the Times when they publish'd their Notions, I rank in their Order, thus:

- M**R. Henry Bond, 1676, By the Magnerical Needle.
 Mr. Ed. Harrison, 1696, Of the several Methods propos'd.
 The Rev. Mr. Geo. Keith, 1709, By the Fixed Stars, Scheder.
 Mr. Francis Cawood, 1712. By Instruments, called *Acute Astromer*.
 M^{rs}. Whiston and Ditton, 1714. By Explosion.
 Mr. John Ward, 1714, By an Automaton.
 Mr. William Hall, 1714, By a Watch and the Sun at Rising.
 Mr. Rob. Brown, 1714, By Celestial Observations, and Watches.
 Mr. Steph. Plank, 1720, By the Moon separating from the Fixed Stars.
 Mr. Tho. Holder, 1723, By a Nonsensical Instrument.
 Mr. Geo. Gorden, 1724, By observing the Eclipses of *Jupiter's* Satellites.
 Capt. Jacob Rowe, 1725, By an Horometer.
 Mr. Jackson, 1726, By a monstrous Machine.
 The Sailor's Proposal, 1726, By *D's* Visible Declination.
 Mr. Rob. Wright, 1728, By *D's* Place, &c.
 Mr. R. Lock, 1730, By the Moon receding from the Sun.
 Mr. John Bates, 1730, By Chimæra's in his Brain.
 Mr. Whiston, 1731, By the Dipping Needle.
 Mr. Eli. Pledger, 1731, By a fluid Quadrant. *Latitude*.
 Mr. Benj Parker, 1731, By the Moon's Southing.
 Mr. John Guest, 1731, By an Armillary Sphere.
 Mr. Rob. Wright, 1732, By the Moon's Place.

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A Table of the Digits and Decimal Parts of the Moon's Light, to every Hour of the first Day after her Change, and from thence to every Day of her Age.

J's Age H.	Digits light.	Moon's Age Days		Digits light.	Moon's Age Days		Digits light.
		d.	h.		d.	h.	
1	.0338983	0	0	— — — —	29	12	— — — —
2	.0677966	1		0.8135592	29		0.4367814
3	.1016949	2		1.6271184	28		1.2203406
4	.1355932	3		2.4406776	27		2.0338998
5	.1694915	4		3.2542368	26		2.8474590
6	.2033898	5		4.0677960	25		3.6610882
7	.2372881	6		4.8813352	24		4.4745774
8	.2711864	7		5.6949144	23		5.2881366
9	.3050847	8		6.5014736	22		6.1016958
10	.3389830	9		7.3220328	21		6.9152550
11	.3728813	10		8.1355920	20		7.7288142
12	.4067796	11		8.9491512	19		8.5123734
13	.4406779	12		9.7627104	18		9.3559328
14	.4745762	13		10.5762696	17		10.1694918
15	.5084745	14		11.3898288	16		10.9830510
16	.5423728						
17	.5762711	14	18	12. — — —	15		11.7966102
18	.6101694						
19	.6440677						
20	.6779660						
21	.7118643						
22	.7457626						
23	.7796609						
24	.8135592						

A Table of the Time that the two Pointers in the Great Bear will be upon the Meridian above the Pole.

Days	January h.	February. h.	March. h.
1	3 M 9	1 M 0	11 A. 15
2	3 5	12 A 56	11 12
3	3 1	12 53	11 8
4	2 56	12 49	11 5
5	2 52	12 46	11 1
6	2 48	12 42	10 57
7	2 44	12 38	10 54
8	2 39	12 34	10 50
9	2 34	12 30	10 46
10	2 30	12 27	10 43
11	2 26	12 23	10 39
12	2 21	12 19	10 36
13	2 17	12 15	10 32
14	2 13	12 11	10 28
15	2 9	12 8	10 25
16	2 5	12 4	10 21
17	2 1	12 0	10 17
18	1 57	11 56	10 14
19	1 53	11 53	10 10
20	1 49	11 49	10 7
21	1 45	11 45	10 3
22	1 41	11 41	9 59
23	1 37	11 38	9 56
24	1 33	11 34	9 52
25	1 28	11 30	9 48
26	1 24	11 27	9 45
27	1 20	11 23	9 41
28	1 16	11 19	9 37
29	1 12	— — —	9 34
30	1 8	— — —	9 30
31	1 4	— — —	9 26

The Table of the time when the two Pointers in the Great Bear will be upon the Meridian above the Pole, continued.

Days.	April.	May.	June.
	h.	h.	h.
1	9 A. 25	7 A. 31	5 A. 26
2	9 21	7 27	5 22
3	9 17	7 23	5 18
4	9 14	7 20	5 13
5	9 10	7 16	5 9
6	9 6	7 12	5 5
7	9 3	7 8	5 1
8	8 59	7 4	4 57
9	8 55	7 0	4 53
10	8 51	6 56	4 49
11	8 48	6 52	4 44
12	8 44	6 48	4 40
13	8 40	6 44	4 36
14	8 36	6 40	4 32
15	8 33	6 36	4 28
16	8 29	6 32	4 24
17	8 25	6 28	4 19
18	8 21	6 23	4 15
19	8 18	6 19	4 11
20	8 14	6 15	4 7
21	8 10	6 11	4 3
22	8 6	6 7	3 59
23	8 2	6 3	3 55
24	7 58	5 59	3 51
25	7 55	5 55	3 46
26	7 51	5 51	3 42
27	7 47	5 47	3 38
28	7 43	5 42	3 34
29	7 39	5 38	3 30
30	7 35	5 34	3 26
31	— —	5 30	— —

 In Page 312, the Time is 2' too little.

The Table of the time when the two Pointers in the Great Bear will be upon the Meridian above the Pole, continued.

Days	July. h.	August. h.	Sept. h.	Oct. h.	Nov. h.	Dec. h.
1	3 A. 22	1 A. 20	11 M. 26	9 M. 38	7 M. 37	5 M. 29
2	3 18	1 16	11 23	9 34	7 33	5 25
3	3 14	1 12	11 19	9 30	7 29	5 20
4	3 10	1 9	11 15	9 26	7 25	5 16
5	3 6	1 5	11 12	9 23	7 21	5 12
6	3 2	1 1	11 8	9 19	7 17	5 7
7	2 58	0 57	11 5	9 15	7 13	5 3
8	2 54	0 54	11 1	9 11	7 9	4 58
9	2 50	0 50	10 57	9 8	7 4	4 54
10	2 46	0 46	10 54	9 4	7 0	4 49
11	2 42	0 42	10 50	9 0	6 56	4 45
12	2 39	0 39	10 47	8 56	6 52	4 41
13	2 35	0 35	10 43	8 52	6 47	4 36
14	2 31	0 32	10 39	8 49	6 43	4 32
15	2 27	0 28	10 36	8 45	6 39	4 27
16	2 22	0 24	10 32	8 41	6 35	4 23
17	2 18	0 21	10 29	8 37	6 30	4 18
18	2 14	0 17	10 25	8 33	6 26	4 14
19	2 10	0 13	10 21	8 29	6 22	4 09
20	2 6	0 10	10 18	8 25	6 17	4 5
21	2 2	0 6	10 14	8 21	6 13	4 1
22	1 58	0 2	10 11	8 17	6 9	3 56
23	1 54	11 M. 59	10 7	8 14	6 4	3 52
24	1 51	11 55	10 5	8 10	6 0	3 47
25	1 47	11 51	10 0	8 6	5 56	3 43
26	1 43	11 48	9 56	8 2	5 51	3 39
27	1 39	11 44	9 52	7 58	5 47	3 34
28	1 35	11 41	9 49	7 54	5 43	3 30
29	1 31	11 37	9 45	7 50	5 38	3 25
30	1 28	11 33	9 41	7 46	5 34	3 21
31	1 24	11 30	—	7 41	—	3 17

in Page 315 the Time is a too little.

The

A Table of the time when the First Pointer in the Little Bear comes to the Meridian above the Pole.

Day	Jan. h. /	Febr. h. /	Mar. h. /	April h. /	May h. /	June h. /
1	7 M 14	5 M 6	3 M 20	1 M 28	11 M 34	9 A 29
2	7 10	5 2	3 17	1 24	11 30	9 25
3	7 6	4 59	3 13	1 20	11 26	9 21
4	7 1	4 55	3 10	1 17	11 23	9 16
5	6 57	4 51	3 6	1 13	11 19	9 12
6	6 53	4 47	3 1	1 9	11 15	9 8
7	6 49	4 43	2 59	1 6	11 11	9 4
8	6 44	4 39	2 55	1 2	11 7	9 0
9	6 40	4 35	2 51	12 A 58	11 3	8 56
10	6 36	4 32	2 48	12 54	10 59	8 52
11	6 32	4 28	2 44	12 51	10 55	8 47
12	6 28	4 24	2 41	12 47	10 51	8 43
13	6 23	4 20	2 37	12 43	10 47	8 39
14	6 19	4 16	2 33	12 39	10 43	8 35
15	6 1	4 13	2 30	12 36	10 39	8 31
16	6 11	4 9	2 26	12 32	10 35	8 27
17	6 7	4 5	2 22	12 28	10 31	8 22
18	6 3	4 1	2 19	12 24	10 26	8 18
19	5 58	3 58	2 15	12 21	10 22	8 14
20	5 54	3 54	2 12	12 17	10 18	8 10
21	5 50	3 50	2 8	12 13	10 14	8 6
22	5 46	3 46	2 4	12 9	10 10	8 2
23	5 42	3 43	2 1	12 5	10 6	7 58
24	5 38	3 39	1 57	12 1	10 2	7 54
25	5 34	3 35	1 53	11 58	9 58	7 49
26	5 30	3 32	1 50	11 54	9 54	7 45
27	5 26	3 28	1 46	11 50	9 50	7 41
28	5 22	3 24	1 42	11 46	9 45	7 37
29	5 18	—	1 39	11 42	9 41	7 33
30	5 14	—	1 35	11 38	9 37	7 29
31	5 10	—	1 31	—	9 33	—

The Table of the time when the First Pointer in the Little Bear comes to the South.

Days	July. h.	August. h.	Sept. h.	Octob. h.	Novem. h.	Decemb. h.
1	7 A. 25	5 A. 23	3 A. 29	1 A. 41	11 M. 40	9 M. 32
2	7 21	5 19	3 26	1 37	11 36	9 28
3	7 17	5 15	3 22	1 33	11 32	9 23
4	7 13	5 12	3 18	1 29	11 28	9 19
5	7 9	5 8	3 15	1 26	11 24	9 15
6	7 5	5 4	3 11	1 22	11 20	9 10
7	7 1	5 0	3 8	1 18	11 16	9 6
8	6 57	4 57	3 4	1 14	11 12	9 1
9	6 53	4 53	3 0	1 11	11 7	8 57
10	6 49	4 49	2 57	1 7	11 3	8 52
11	6 45	4 46	2 53	1 3	10 59	8 48
12	6 41	4 42	2 50	0 59	10 55	8 44
13	6 37	4 38	2 49	0 55	10 50	8 39
14	6 33	4 35	2 42	0 52	10 46	8 35
15	6 29	4 31	2 39	0 48	10 42	8 30
16	6 25	4 27	2 35	0 44	10 38	8 26
17	6 21	4 24	2 32	0 40	10 33	8 21
18	6 17	4 20	2 28	0 36	10 29	8 17
19	6 13	4 16	2 24	0 32	10 25	8 12
20	6 9	4 13	2 21	0 28	10 20	8 8
21	6 5	4 9	2 17	0 24	10 16	8 4
22	6 1	4 5	2 14	0 21	10 12	7 59
23	5 57	4 2	2 10	0 17	10 7	7 55
24	5 54	3 58	2 6	0 13	10 3	7 50
25	5 50	3 54	2 3	0 9	9 59	7 46
26	5 46	3 51	1 59	0 5	9 54	7 42
27	5 42	3 47	1 55	0 1	9 50	7 37
28	5 38	3 44	1 53	11 M. 57	9 46	7 33
29	5 34	3 40	1 48	11 53	9 41	7 28
30	5 31	3 36	1 44	11 49	9 37	7 24
31	5 27	3 33		11 44		7 20

Table of the Nonagesime Degree, as the Obliquity of the Ecliptic is 23 Degrees, 29 Minutes, and Seconds.

Decorative separator line

32	0	0	0	0	0
28	11	0	11	0	1
23	24	1	24	1	2
19	37	2	37	2	3
15	50	3	50	3	4
10	63	4	63	4	5
6	76	5	76	5	6
I	89	6	89	6	7
57	02	7	02	7	8
52	15	8	15	8	9
48	28	9	28	9	10
44	41	10	41	10	11
39	54	11	54	11	12
35	07	12	07	12	13
30	20	13	20	13	14
26	33	14	33	14	15
21	46	15	46	15	16
17	59	16	59	16	17
12	12	17	12	17	18
8	25	18	25	18	19
4	38	19	38	19	20
59	51	20	51	20	21
55	04	21	04	21	22
50	17	22	17	22	23
46	30	23	30	23	24
42	43	24	43	24	25
37	56	25	56	25	26
33	09	26	09	26	27
28	22	27	22	27	28
24	35	28	35	28	29
20	48	29	48	29	30

A

T A B L E

OF THE

Nonagesime Degree,

To the Obliquity of the Ecliptic 23 Degrees, 29 Minutes, from the Equator to 60 Degrees of North and South Latitude.

Decorative separator line

ab,
Be.
ab,
32
28
23
19
15
10
6
I
57
52
48
44
39
35
30
26
21
17
12
8
4
59
55
50
46
42
37
33
28
24
20

A Table of the Nonagesime Degree, to the Obliquity of the
Ecliptic $23^{\circ} 29'$ and Latitude 0° .

925

Cusp 10. Aries.	R. Ascen. M. Cali.		Nonage- sime.	
0	0	0	0	0
1	0	55	0	51
2	1	50	1	42
3	2	45	2	32
4	3	40	3	22
5	4	35	4	12
6	5	30	5	3
7	6	26	5	54
8	7	21	6	44
9	8	16	7	35
10	9	11	8	26
11	10	$6\frac{1}{2}$	9	17
12	11	2	10	8
13	11	57	10	59
14	12	53	11	50
15	13	48	12	42
16	14	44	13	33
17	15	40	14	25
18	16	36	15	16
19	17	32	16	8
20	18	28	17	1
21	19	24	17	53
22	20	20	18	46
23	21	16	19	38
24	22	13	20	31
25	23	9	21	14
26	24	6	22	17
27	25	3	23	11
28	26	0	24	5
29	26	57	24	59
30	27	54	25	54

The Table of the Nonagesime Degree, to the Obliquity of the
Ecliptic $23^{\circ} 29'$, and Latitude 0° , continued.

Cusp 10. Taurus.	R. Ascen. M. Cali.		Nonage- sime.	
0	0	1	0	1
0	27	54	25	54
1	28	52	26	48
2	29	49	27	43
3	30	47	28	38
4	31	45	29	34
5	32	43	0	29
6	33	41	1	25
7	34	39	2	21
8	35	37	3	18
9	36	36	4	15
10	37	35	5	12
11	38	34	6	10
12	39	33	7	8
13	40	32	8	6
14	41	32	9	4
15	42	32	10	3
16	43	31	11	2
17	44	31	12	2
18	45	32	13	1
19	46	32	14	2
20	47	33	15	3
21	48	33	16	4
22	49	34	17	5
23	50	36	18	7
24	51	37	19	10
25	52	38	20	14
26	53	40	21	16
27	54	42	22	19
28	55	44	23	23
29	56	46	24	27
30	57	49	25	31

The Table of the Nonagesime Degree, to the Obliquity of the
Ecliptic $23^{\circ} 29'$, and Latitude 0° , continu'd.

Ab us.

Cusp 10. Gemini.	R. Ascen. M. Celi.	Nonage- sime.
0	57 49	25 31
1	58 51	26 35
2	59 54	26 40
3	60 57	28 46
4	62 0	29 52
5	63 3	0 II 59
6	64 6	2 9
7	65 10	3 13
8	66 14	4 20
9	67 17	5 28
10	68 21	6 35
11	69 25	7 43
12	70 30	8 52
13	71 34	10 1
14	72 38	11 11
15	73 43	12 20
16	74 48	13 29
17	75 52	14 39
18	76 57	15 49
19	78 2	16 59
20	79 7	18 9
21	80 12	19 20
22	81 17	20 31
23	82 22	21 42
24	83 28	22 52
25	84 33	24 3
26	85 38	25 14
27	86 44	26 26
28	87 49	27 37
29	88 55	28 49
30	90 0	0 5 0

mp

The Table of the Nonagesime Degree, to the Obliquity of the
Ecliptic $23^{\circ} 29'$, and Latitude 0° , continu'd.

Cusp 10. Cancer.	R. Ascen. M. Cal.	Nonage- sime.
0	90 0	0 0
1	92 5	1 11
2	92 11	2 23
3	93 16	3 34
4	94 22	4 46
5	95 27	5 57
6	96 32	7 8
7	97 38	8 18
8	98 43	9 29
9	99 48	10 40
10	100 53	11 51
11	101 58	13 1
12	103 3	14 11
13	104 8	15 21
14	105 12	16 31
15	106 17	17 40
16	107 22	18 49
17	108 26	19 59
18	109 30	21 8
19	110 35	22 17
20	111 39	23 25
21	112 43	24 33
22	113 46	25 40
23	114 50	26 47
24	115 54	27 54
25	116 57	29 1
26	118 0	0 3
27	119 3	1 13
28	120 6	2 19
29	121 9	3 24
30	122 11	4 29

The Table of the Nonagesime Degree, to the Obliquity of the
Ecliptic $23^{\circ} 39'$, and 0° Latitude.

Culp 10. Leo.	R. Alcen. M. Cali	Nonage- time.
0	122 11	4 29
1	123 14	5 33
2	124 16	6 37
3	125 18	7 41
4	126 20	8 44
5	127 22	9 47
6	128 23	10 50
7	129 24	11 53
8	130 26	12 55
9	131 26	13 56
10	132 27	14 57
11	133 28	15 58
12	134 28	16 58
13	135 29	17 58
14	136 29	18 58
15	137 28	19 57
16	138 28	20 56
17	139 28	21 54
18	140 27	22 52
19	141 26	23 50
20	142 25	24 48
21	143 24	25 45
22	144 23	26 42
23	145 21	27 39
24	146 19	28 35
25	147 17	29 31
26	148 15	0 26
27	149 13	1 22
28	150 11	2 17
29	151 8	3 12
30	152 6	4 6

A Table of the Nonagesime Degree, to the Obliquity of the
Ecliptic $23^{\circ} 29'$, and Latitude 0° , continu'd.

Cusp 10. Virgo.	R. Ascen. M. Celi.		Nonage- time.	
0	0	1	0	1
0	152	6	4	6
1	153	3	5	1
2	154	0	5	55
3	154	37	6	49
4	155	54	7	42
5	156	51	8	36
6	157	47	9	29
7	158	44	10	22
8	159	40	11	14
9	160	36	12	7
10	161	32	12	59
11	162	28	13	52
12	163	24	14	44
13	164	20	15	35
14	165	16	16	27
15	166	12	17	18
16	167	7	18	10
17	168	3	19	1
18	168	58	19	52
19	169	53	20	43
20	170	49	21	34
21	171	44	22	25
22	172	39	23	16
23	173	34	24	7
24	174	30	24	57
25	175	25	25	48
26	176	20	26	38
27	177	15	27	28
28	178	10	28	18
29	179	5	29	9
30	180	0	0	0

The Table of the Nonagesime Degree, to the Obliquity of the
Ecliptic $23^{\circ} 29'$, and Latitude 9° , continued.

Cusp 10. Libra.	R. Ascen. M. Celi.	Nonage- sime.
0	180	0
1	180	55
2	181	50
3	182	45
4	183	40
5	184	35
6	185	30
7	186	26
8	187	21
9	188	16
10	189	11
11	190	6
12	191	2
13	191	57
14	192	51
15	193	48
16	194	44
17	195	40
18	196	36
19	197	32
20	198	28
21	199	24
22	200	20
23	201	16
24	202	13
25	203	9
26	204	6
27	205	3
28	206	0
29	207	57
30	208	54

A Table of the Nonagesime Degree, to the Obliquity of the Ecliptic 23° 29', and Latitude 0°, continued.

Culp. to. Scorpio.	R. Areen. M. Culi.	Nonage- line.
0	207 54	25 54
1	208 12	26 48
2	209 49	27 43
3	210 47	28 38
4	211 45	29 34
5	212 43	0 29
6	213 41	1 25
7	214 39	2 21
8	215 37	3 18
9	216 36	4 15
10	217 35	5 12
11	218 34	6 10
12	219 33	7 8
13	220 32	8 6
14	221 32	9 4
15	222 32	10 3
16	223 31	11 2
17	224 31	12 2
18	225 32	13 1
19	226 32	14 2
20	227 33	15 3
21	228 33	16 4
22	229 34	17 5
23	230 36	18 7
24	231 37	19 10
25	232 38	20 13
26	233 40	21 16
27	234 42	22 19
28	235 44	23 23
29	236 46	24 27
30	237 49	25 31

The Table of the Nonagesime Degree, to the Obliquity of the
Ecliptic $23^{\circ} 29'$, and Latitude 0° , continued.

Cusp to. Sagittary	R. Ascen. M. Cali.	Nonage- sime.
0	237 49	25 31
1	238 51	26 35
2	239 54	27 40
3	240 57	28 46
4	242 0	29 52
5	243 3	0 59
6	244 6	2 6
7	245 10	3 13
8	246 14	4 20
9	247 17	5 28
10	248 21	6 35
11	249 25	7 43
12	250 30	8 52
13	251 34	10 1
14	252 38	11 11
15	253 43	12 20
16	254 48	13 29
17	255 52	14 39
18	256 57	15 49
19	258 2	16 59
20	259 7	18 9
21	260 12	19 20
22	261 17	20 31
23	262 22	21 42
24	263 28	22 52
25	264 33	24 3
26	265 38	25 14
27	266 44	26 26
28	267 49	27 37
29	268 55	28 49
30	270 0	0 0

The Table of the Nonagesime Degree, to the Obliquity of the
Ecliptic $23^{\circ} 29'$, and Latitude 0° , continu'd.

Cusp 10. Capricorn.	R. Ascen. M. Cal.	Nonage- time.
0	270 0	0 0
1	271 5	1 11
2	272 11	2 23
3	273 16	3 34
4	274 22	4 46
5	275 27	5 57
6	276 32	7 8
7	277 38	8 18
8	278 43	9 29
9	279 48	10 40
10	280 53	11 51
11	281 58	13 1
12	283 3	14 11
13	284 8	15 21
14	285 12	16 31
15	286 17	17 40
16	287 22	18 49
17	288 26	19 59
18	289 30	21 8
19	290 35	22 17
20	291 39	23 25
21	292 43	24 33
22	293 46	25 40
23	294 50	26 47
24	295 54	27 54
25	296 57	29 1
26	298 0	0 7
27	299 3	1 13
28	300 6	2 19
29	301 9	3 24
30	302 11	4 29

The Table of the Nonagesimal Degree, to the Obliquity of the
Ecliptic, $23^{\circ} 29'$, and Latitude 0° .

Cusp 19. Aquarius	R. Ascen. M. Cel.	Nonage- fine.
0	302 11	4 29
1	303 14	5 33
2	304 16	6 37
3	305 18	7 41
4	306 20	8 44
5	307 22	9 47
6	308 23	10 50
7	309 24	11 53
8	310 26	12 55
9	311 26	13 56
10	312 27	14 57
11	313 28	15 58
12	314 28	16 58
13	315 29	17 58
14	316 29	18 58
15	317 28	19 57
16	318 28	20 56
17	319 28	21 54
18	320 27	22 52
19	321 26	23 50
20	322 25	24 48
21	323 24	25 45
22	324 23	26 42
23	325 21	27 39
24	326 19	28 35
25	327 17	29 31
26	328 15	0 26
27	329 13	1 22
28	330 11	2 17
29	331 8	3 12
30	332 6	4 6

The Table of the Nonagesime Degree, to the Obliquity of the
Ecliptic $23^{\circ} 29'$, and Latitude 0° , continued.

Cusp 10. Pisces.	R. Ascen. M. Cali.	Nonage- sime.
0	332 6	4 36 6
1	333 3	5 1
2	334 0	5 55
3	334 57	6 49
4	335 54	7 43
5	336 51	8 36
6	337 47	9 29
7	338 44	10 22
8	339 40	11 14
9	340 36	12 7
10	341 32	12 59
11	342 28	13 52
12	343 24	14 44
13	344 20	15 35
14	345 16	16 27
15	346 12	17 19
16	347 7	18 10
17	348 3	19 1
18	348 58	19 52
19	349 53 $\frac{1}{2}$	20 43
20	350 49	21 34
21	351 44	22 25
22	352 39	23 16
23	353 34	24 6
24	354 30	24 57
25	355 25	25 47
26	356 20	26 37
27	357 15	27 28
28	358 10	28 18
29	359 5	29 9
30	360 0	0 0

Table of the Nonagesime Degree, to the Latitude of 4 Degrees.

Cutp 10. Aries.	Nonage- sime.	Cutp 10 Taurus.	Nonage- sime.
0	1 36	0	27 20
1	2 28	1	28 14
2	3 18	2	29 8
3	4 13	3	0 2
4	4 58	4	0 57
5	5 48	5	1 52
6	6 39	6	2 47
7	7 30	7	3 43
8	8 20	8	4 38
9	9 10	9	5 34
10	10 1	10	6 31
11	10 52	11	7 28
12	11 42	12	8 24
13	12 33	13	9 22
14	13 24	14	10 20
15	14 16	15	11 18
16	15 7	16	12 16
17	15 58	17	13 15
18	16 49	18	14 13
19	17 40	19	15 12
20	18 33	20	16 12
21	19 25	21	17 12
22	20 16	22	18 12
23	21 7	23	19 12
24	22 0	24	20 14
25	22 53	25	21 15
26	23 45	26	22 17
27	24 39	27	23 19
28	25 32	28	24 21
29	26 26	29	25 25
30	27 20	30	26 26

The Table of the Nonagesime Degree, for the Latitude of
4 Degrees, continu'd.

2 as *2 as*

Cusp 10. Gemini. °	Nona- gesime. °		Cusp 10. Cancer. °	Nona- gesime. °	
0	26 0 26		0	0 0 0	
1	27 29		1	1 9	
2	28 33		2	2 19	
3	29 37		3	3 28	
<i>my</i> 4	0 II 42		4	4 38	
<i>as</i> 5	1 47		5	5 47	
6	2 52		6	6 56	
7	3 58		7	8 4	
8	5 3		8	9 13	
9	6 9		9	10 22	
10	7 15		10	11 31	
11	8 21		11	12 39	
12	9 28		12	13 47	
13	10 35		13	14 55	
14	11 42		14	16 3	
15	12 49		15	17 11	
16	13 56		16	18 18	
17	15 5		17	19 26	
18	16 13		18	20 33	
19	17 21		19	21 40	
20	18 29		20	22 46	
21	19 38		21	23 51	
22	20 47		22	24 58	
23	21 56		23	25 3	
24	23 5		24	27 9	
25	24 14		25	28 14	
26	25 23		26	29 18	
27	26 31		27	0 24	
28	27 42		28	1 27	
29	28 51		29	2 30	
30	0 0 0		30	3 34	

The Table of the Nonagesime Degree, for the Latitude of
4 Degrees, continued.

Virgo as

pas

Cusp 10. Leo. °	Nona- gesime. °	Cusp 10. Virgo. °	Nona- gesime. °
0	3 34	0	2 40
1	4 37	1	3 35
2	5 40	2	4 28
3	6 42	3	5 21
4	7 44	4	6 14
5	8 45	5	7 7
6	9 47	6	8 0
7	10 48	7	8 52
8	11 49	8	9 44
9	12 49	9	10 36
10	13 48	10	11 28
11	14 48	11	12 20
12	15 47	12	13 12
13	16 46	13	14 3
14	17 44	14	14 54
15	18 43	15	15 45
16	19 41	16	16 36
17	20 39	17	17 27
18	21 36	18	18 18
19	22 33	19	19 9
20	23 30	20	19 59
21	24 26	21	20 50
22	25 22	22	21 41
23	26 18	23	22 31
24	27 14	24	23 21
25	28 9	25	24 12
26	29 3	26	25 2
27	29 58	27	25 52
28	0 53	28	26 42
29	1 47	29	27 33
30	2 40	30	28 23

A Table of the Nonagesimo Degree, for the Latitude of 4 Degrees.

Cusp 10. Libra.	Nonage- simo.	Cusp 10. Scorpio.	Nonage- simo.
0	28 23	0	24 23
1	29 14	1	25 18
2	0 4	2	26 14
3	0 55	3	27 9
4	1 45	4	28 6
5	2 36	5	29 2
6	3 27	6	29 58
7	4 17	7	0 55
8	5 8	8	1 52
9	5 59	9	2 50
10	6 50	10	3 48
11	7 41	11	4 46
12	8 32	12	5 44
13	9 23	13	6 44
14	10 14	14	7 43
15	11 6	15	8 43
16	11 56	16	9 43
17	12 50	17	10 44
18	13 42	18	11 45
19	14 34	19	12 46
20	15 27	20	13 49
21	16 19	21	14 51
22	17 12	22	15 55
23	18 5	23	16 58
24	18 58	24	18 1
25	19 52	25	19 5
26	20 45	26	20 9
27	21 39	27	21 14
28	22 34	28	22 19
29	23 28	29	23 25
30	24 23	30	24 31

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The Table of the Nonagesimo Degree for the Latitude of
4 Degrees, continued.

as

as

as

Cusp 10. Sagittary	Nona- gesime.	Cusp 10. Capricorn	Nona- gesime.
0	24 31	0	0 0
1	25 36	1	1 13
2	26 42	2	2 27
3	27 50	3	3 41
4	28 57	4	4 35
5	29 6	5	6 9
6	1 14	6	7 21
7	2 20	7	8 35
8	3 32	8	9 48
9	4 42	9	11 1
10	5 51	10	12 14
11	7 1	11	13 27
12	9 11	12	14 39
13	10 23	13	15 51
14	11 34	14	17 2
15	12 45	15	18 4
16	13 57	16	19 26
17	14 9	17	20 38
18	15 22	18	21 49
19	16 34	19	23 0
20	17 46	20	24 9
21	19 59	21	25 19
22	20 12	22	26 26
23	21 25	23	27 37
24	22 38	24	28 46
25	23 52	25	29 54
26	25 5	26	1 2
27	26 19	27	2 10
28	27 33	28	3 18
29	28 47	29	4 24
30	0 0	30	5 32

as

as

as

The Table of the Nonagesime Degree for the Latitude of
4 Degrees, continued.

Cusp 10. Aquarius °	Nonage- sime. .		Cusp 10. Pisces. °	Nonage- sime. .	
0	5	32	0	5	37
1	6	36	1	6	32
2	7	42	2	7	27
3	8	47	3	8	21
4	9	51	4	9	15
5	10	55	5	10	08
6	12	0	6	11	2
7	13	4	7	11	56
8	14	7	8	12	48
9	15	9	9	13	41
10	16	11	10	14	33
11	17	13	11	15	27
12	18	14	12	16	19
13	19	16	13	17	10
14	20	17	14	18	3
15	21	17	15	18	55
16	22	17	16	19	46
17	23	16	17	20	38
18	24	15	18	21	29
19	25	14	19	22	21
20	26	12	20	23	11
21	27	10	21	24	2
22	28	8	22	24	53
23	29	6	23	25	43
24	0	3	24	26	34
25	0	59	25	27	24
26	1	56	26	28	15
27	2	52	27	29	5
28	3	47	28	29	56
29	4	42	29	0	46
30	5	37	30	1	36

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Table of the Nonagesime Degree, for the Latitude of
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Cusp 10. Aries.	Nonagesime.	Cusp 10. Taurus.	Nonagesime.
1	3 741	1	28 746
2	4 14	2	29 139
3	4 54	3	0 333
4	5 44	4	1 26
5	6 35	5	2 20
6	7 25	6	3 14
7	8 15	7	4 8
8	9 5	8	5 3
9	9 55	9	5 58
10	10 45	10	6 53
11	11 36	11	7 49
12	12 26	12	8 45
13	13 16	13	9 41
14	14 7	14	10 38
15	14 58	15	11 35
16	15 49	16	12 32
17	16 40	17	13 30
18	17 30	18	14 27
19	18 21	19	15 24
20	19 12	20	16 22
21	20 4	21	17 20
22	20 55	22	18 19
23	21 46	23	19 18
24	22 37	24	20 17
25	23 29	25	21 17
26	24 22	26	22 17
27	25 14	27	23 17
28	26 7	28	24 17
29	26 59	29	25 18
30	27 52	30	26 19
	28 46		27 20

The Table of the Nonagesime Degree, for the Latitude of
8 Degrees, continu'd.

Cusp 10. Gemini.	Nonage- sime.	Cusp 10. Cancer.	Nonage- sime.
0	27 0 21	0	0 5 0
1	28 23	1	1 8
2	29 25	2	2 15
3	0 28	3	3 21
4	1 31	4	4 29
5	2 35	5	5 36
6	3 38	6	6 43
7	4 42	7	7 50
8	5 46	8	8 57
9	6 50	9	10 3
10	7 54	10	11 10
11	8 58	11	12 17
12	10 3	12	13 23
13	11 8	13	14 29
14	12 13	14	15 35
15	13 18	15	16 41
16	14 24	16	17 47
17	15 30	17	18 52
18	16 36	18	19 52
19	17 42	19	21 2
20	18 49	20	22 7
21	19 56	21	23 11
22	21 3	22	24 15
23	22 10	23	25 19
24	23 17	24	26 23
25	24 24	25	27 26
26	25 31	26	28 29
27	26 36	27	29 32
28	27 46	28	0 34
29	28 53	29	1 36
30	0 5 0	30	2 39

The Table of the Nonagesime Degree, for the Latitude of
8 Degrees, continu'd.

*mas**pas*

Cusp 10. Leo.	Nonage- sime.	Cusp 10. Virgo.	Nonage- sime.
0	2 39	0	1 14
1	3 41	1	2 8
2	4 42	2	3 1
3	5 43	3	3 53
4	6 44	4	4 46
5	7 45	5	5 38
6	8 45	6	6 30
7	9 43	7	7 22
8	10 42	8	8 14
9	11 41	9	9 5
10	12 40	10	9 57
11	13 38	11	10 48
12	14 36	12	11 39
13	15 33	13	12 30
14	16 30	14	13 20
15	17 28	15	14 11
16	18 25	16	15 2
17	19 22	17	15 53
18	20 19	18	16 43
19	21 15	19	17 34
20	22 11	20	18 24
21	23 6	21	19 14
22	24 2	22	20 5
23	24 57	23	20 55
24	25 52	24	21 45
25	26 46	25	22 35
26	27 40	26	23 25
27	28 34	27	24 15
28	29 38	28	25 6
29	0 21	29	25 56
30	1 14	30	26 46

pas

The Table of the Nonagesime Degree for the Latitude of
8 Degrees, continued.

as *as*

Cusp 10. Libra.	Nonage- sime.	Cusp 10. Scorpio.	Nonage- sime.
0	26 ^m 46	0	22 ^m 53
1	27 37	1	23 48
2	28 27	2	24 44
3	29 18	3	25 40
4	0 ^m 8	4	26 37
5	0 59	5	27 34
6	1 50	6	28 31
7	2 40	7	29 29
8	3 31	8	2 ^m 26 <i>un as</i>
9	4 22	9	1 24
10	5 13	10	2 23
11	6 4	11	3 22
12	6 55	12	4 22
13	7 46	13	5 22
14	8 38	14	6 22
15	9 30	15	7 23
16	10 22	16	8 24
17	11 15	17	9 26
18	12 7	18	10 28
19	12 59	19	11 31
20	13 52	20	12 34
21	14 45	21	13 38
22	15 48	22	14 43
23	16 31	23	15 48
24	17 25	24	16 52
25	18 19	25	17 57
26	19 13	26	19 2
27	20 7	27	20 8
28	21 2	28	21 15
29	21 57	29	22 22
30	22 53	30	23 29

The Table of the Nona-gesime Degree, for the Latitude of
8 Degrees, continued.

m 21

p 4.5

Cusp 10 Sagittary °	Nona- gesime. °	Cusp 10 Capricorn °	Nona- gesime. °
0	23 m 29	0	0 vs 0
1	24 36	1	1 16
2	25 44	2	2 32
3	26 53	3	3 48
4	28 2	4	5 4
5	29 12	5	6 20
6	0 22	6	7 36
7	1 33	7	8 52
8	2 44	8	10 7
9	3 56	9	11 22
10	5 7	10	12 37
11	6 19	11	13 52
12	7 31	12	15 6
13	8 44	13	16 20
14	9 57	14	17 35
15	11 10	15	18 49
16	12 24	16	20 3
17	10 39	17	21 17
18	14 54	18	22 30
19	16 8	19	23 42
20	17 23	20	24 53
21	18 38	21	26 5
22	19 53	22	27 16
23	21 8	23	28 27
24	22 24	24	29 37
25	23 40	25	0 47
26	24 56	26	1 57
27	26 12	27	3 7
28	27 28	28	4 16
29	28 44	29	5 24
30	0 vs 0	30	6 32

The Table of the Nonagesime Degree, for the Latitude of
8 Degrees, continued.

as

nas.

Cusp 10. Aquarius	Nonage- sime.	Cusp 10. Pisces.	Nonage- sime.
0	6 32	0	7 7
1	7 39	1	8 3
2	8 46	2	8 58
3	9 52	3	9 53
4	10 58	4	10 47
5	12 3	5	11 41
6	13 9	6	12 35
7	14 14	7	13 29
8	15 18	8	14 22
9	16 22	9	15 15
10	17 25	10	16 8
11	18 28	11	17 1
12	19 31	12	17 58
13	20 33	13	18 45
14	21 35	14	19 38
15	22 36	15	20 30
16	23 37	16	21 22
17	24 37	17	22 14
18	25 37	18	23 5
19	26 37	19	23 55
20	27 36	20	24 47
21	28 35	21	25 38
22	29 34	22	26 29
23	0 33	23	27 20
24	1 31	24	28 11
25	2 28	25	29 1
26	3 25	26	29 52
27	4 21	27	0 42
28	5 16	28	1 33
29	7 12	29	2 23
30	7 7	30	3 11

A Table of the Nonagesime Degree, for the Latitude of 12 Degrees.

Cusp 10. Aries.	Nona- gesime.	Cusp 10. Taurus.	Nona- gesime.
10	4 50	0	0 11
11	5 44	1	1 3
12	6 33	2	1 56
13	7 23	3	2 49
14	8 13	4	3 42
15	9 1	5	4 34
16	9 51	6	5 28
17	10 41	7	6 22
18	11 33	8	7 17
19	12 22	9	8 11
20	13 13	10	9 6
21	14 2	11	10 0
22	14 52	12	10 55
23	15 42	13	11 51
24	16 33	14	12 47
25	17 23	15	13 43
26	18 13	16	14 39
27	19 3	17	15 35
28	19 54	18	16 31
29	20 44	19	17 28
30	21 35	20	18 25
1	22 26	21	19 22
2	23 17	22	20 20
3	24 7	23	21 19
4	24 59	24	22 17
5	25 51	25	23 16
6	26 42	26	24 15
7	27 34	27	25 14
8	28 26	28	26 14
9	29 18	29	27 14
10	0 11	30	28 14

The Table of the Nonagesime Degree, for the Latitude of
12 Degrees, continued.

Cusp 10. Gemini.	Nonage- sime.	Cusp 10. Cancer.	Nonage- sime.
0	28 0 14	0	0 5 0
1	29 14	1	1 6
2	0 II 15	2	2 12
3	1 16	3	3 17
4	2 17	4	4 22
5	3 19	5	5 27
6	4 21	6	6 33
7	5 23	7	7 37
8	6 25	8	8 42
9	7 28	9	9 45
10	8 50	10	10 52
11	9 33	11	11 58
12	10 36	12	13 1
13	11 39	13	14 5
14	12 43	14	15 10
15	13 46	15	16 14
16	14 50	16	17 18
17	15 55	17	18 21
18	16 59	18	19 24
19	18 3	19	20 27
20	19 8	20	21 30
21	20 13	21	22 33
22	21 18	22	23 35
23	22 23	23	24 38
24	23 28	24	25 40
25	24 34	25	26 42
26	25 39	26	27 42
27	26 43	27	28 44
28	27 52	28	29 45
29	28 55	29	0 46
30	0 5 0	30	1 47

The Table of the Nonagesime Degrees, for the Latitude of
12 Degrees, continu'd.

mas *pas*

Cusp 10. Leo.	Nonage- sime.	Cusp 10. Virgo.	Nonage- sime.
0	1 47	0	29 50
1	2 46	1	0 43
2	3 46	2	1 35
3	4 46	3	2 26
4	5 45	4	3 18
5	6 44	5	4 10
6	7 43	6	5 1
7	8 41	7	6 52
8	9 39	8	7 43
9	10 37	9	8 34
10	11 35	10	8 25
11	12 32	11	9 16
12	13 29	12	10 8
13	14 26	13	11 58
14	15 22	14	12 47
15	16 18	15	13 38
16	17 14	16	14 28
17	18 9	17	15 18
18	19 5	18	16 8
19	20 0	19	17 58
20	20 54	20	18 48
21	21 49	21	19 38
22	22 43	22	20 28
23	23 37	23	21 18
24	24 32	24	22 7
25	25 25	25	23 57
26	26 19	26	24 47
27	27 12	27	25 37
28	28 5	28	26 27
29	28 57	29	27 17
30	29 50	30	28 7

The Table of the Nonagesime Degree, for the Latitude of
12 Degrees, continued.

pas *gas*

Cusp 10. <i>Libra.</i>	Nonage- sime.	Cusp 10. <i>Scorpio.</i>	Nonage- sime.
0	25 ^{III} 7	0	21 ^{II} 14
1	25 57	1	22 9
2	26 47	2	23 6
3	27 37	3	24 2
4	28 28	4	25 0
5	29 19	5	25 57
6	0 ^{II} 9	6	26 55
7	0 59	7	27 53
8	1 50	8	28 51
9	2 41	9	29 50
10	3 32	10	0 ^m 50
11	4 23	11	1 50
12	5 13	12	2 51
13	6 6	13	3 51
14	6 57	14	4 53
15	7 49	15	5 54
16	8 41	16	6 56
17	9 33	17	7 59
18	10 25	18	9 2
19	11 18	19	10 6
20	12 11	20	11 10
21	13 4	21	12 15
22	13 57	22	13 20
23	14 51	23	14 26
24	15 45	24	15 32
25	16 40	25	16 39
26	17 33	26	17 45
27	18 28	27	18 53
28	19 23	28	20 1
29	20 18	29	21 9
30	21 14	30	22 18

as.

The Table of the Nonagesime Degree for the Latitude of
12 Degrees, continued

Cusp 10. Sagittary	Nonage- sime.	Cusp 10. Capricorn	Nonage- sime.
0	22 11 18	0	0 VS 0
1	23 27	1	1 18
2	24 37	2	2 38
3	25 48	3	3 57
4	26 59	4	5 15
5	28 11	5	6 34
6	29 23	6	7 52
7	0 36	7	9 10
8	1 49	8	10 28
9	3 3	9	11 46
10	4 18	10	13 4
11	5 31	11	14 22
12	6 45	12	15 38
13	8 0	13	16 55
14	9 15	14	18 12
15	10 31	15	19 29
16	11 48	16	20 45
17	13 5	17	22 1
18	14 22	18	23 14
19	15 39	19	24 31
20	16 57	20	25 45
21	18 15	21	26 59
22	19 32	22	28 12
23	20 50	23	29 25
24	22 9	24	0 36
25	23 27	25	1 49
26	24 41	26	3 1
27	26 4	27	4 12
28	27 22	28	5 23
29	28 41	29	6 33
30	0 VS 0	30	7 44

The Table of the Nonagesime Degree for the Latitude of
12 Degrees, continued.

<i>Gas</i>		<i>Pisces</i>	
Culp 10. Aquarius °	Nona- gesime. °	Culp 10. Pisces. °	Nona- gesime. °
0	7 [~] 44	0	8 [~] 47
1	8 15	1	9 43
2	10 0	2	10 38
3	11 7	3	11 33
4	12 15	4	12 27
5	13 22	5	13 22
6	14 29	6	14 16
7	15 36	7	15 10
8	16 40	8	16 4
9	17 45	9	16 57
10	18 49	10	17 50
11	19 54	11	18 43
12	20 58	12	19 35
13	22 1	13	20 27
14	23 4	14	21 20
15	24 8	15	22 12
16	25 7	16	23 5
17	26 8	17	23 55
18	27 11	18	24 46
19	28 13	19	25 37
20	29 9	20	26 28
21	0 [~] 9	21	27 19
22	1 9	22	28 10
23	2 8	23	29 1
24	3 6	24	29 51
25	4 4	25	0 [~] 42
26	5 2	26	1 33
27	5 59	27	2 23
28	6 55	28	3 13
29	7 51	29	4 5
30	8 47	30	4 50

A Table of the Nonagesime Degree, to the Latitude of
16 Degrees.

Cusp 10. Aries.	Nonage- sime.	Cusp 10. Taurus.	Nonage- sime.
0	6 33	0	1 55
1	7 23	1	2 27
2	8 12	2	3 19
3	9 2	3	4 11
4	9 51	4	5 3
5	10 41	5	5 55
6	11 31	6	6 48
7	12 20	7	7 41
8	13 20	8	8 35
9	13 59	9	9 28
10	14 49	10	10 22
11	15 38	11	11 15
12	16 28	12	12 9
13	17 17	13	13 3
14	18 7	14	13 58
15	18 57	15	14 53
16	19 46	16	15 48
17	20 36	17	16 43
18	21 26	18	17 38
19	22 16	19	18 33
20	23 6	20	19 29
21	23 56	21	20 25
22	24 47	22	21 22
23	25 37	23	22 20
24	26 28	24	23 17
25	27 19	25	24 15
26	28 10	26	25 13
27	28 1	27	26 11
28	29 52	28	27 9
29	0 43	29	28 8
30	1 35	30	29 6

The Table of the Nonagesime Degree, for the Latitude of
16 Degrees, continu'd.

Cusp 10. Gemini.	Nonagesime.	Cusp 10. Cancer.	Nonagesime.
0	29 0 6	0	0 0 0
1	0 II 5	1	1 4
2	1 4	2	2 8
3	2 3	3	3 11
4	3 3	4	4 15
5	4 3	5	5 18
6	5 3	6	6 21
7	6 4	7	7 24
8	7 4	8	8 27
9	8 5	9	9 30
10	9 6	10	10 33
11	10 7	11	11 36
12	11 9	12	12 39
13	12 10	13	13 41
14	13 12	14	14 44
15	14 14	15	15 46
16	15 16	16	16 48
17	16 19	17	17 50
18	17 21	18	18 51
19	18 24	19	19 52
20	19 27	20	20 53
21	20 30	21	21 54
22	21 33	22	22 55
23	22 36	23	23 56
24	23 39	24	24 56
25	24 43	25	25 57
26	25 46	26	26 57
27	26 49	27	27 56
28	27 52	28	28 56
29	28 56	29	29 55
30	0 0 0	30	0 54

[The Table of the Nonagesime Degree, for the Latitude of
16 Degrees, continued.

mas

Cusp 10. Leo. °	Nonage- sime. °	Cusp 10. Virgo. °	Nonage- sime. °
0	0 54	0	28 25
1	1 52	1	29 17
2	2 50	2	0 8
3	3 48	3	0 59
4	4 46	4	1 50
5	5 54	5	2 41
6	6 42	6	3 31
7	7 39	7	4 22
8	8 36	8	5 12
9	9 33	9	6 3
10	10 29	10	6 53
11	11 26	11	7 43
12	12 22	12	8 33
13	13 18	13	9 24
14	14 13	14	10 14
15	15 8	15	11 4
16	16 2	16	11 54
17	16 56	17	12 43
18	17 50	18	13 33
19	18 44	19	14 22
20	19 37	20	15 12
21	20 31	21	16 1
22	21 24	22	16 51
23	22 17	23	17 40
24	23 11	24	18 29
25	24 4	25	19 19
26	24 57	26	20 9
27	25 49	27	20 58
28	26 41	28	21 47
29	27 33	29	22 37
30	28 25	30	23 27

The Table of the Nonagesime Degree, for the Latitude of
16 Degrees, continued.

Cusp 10. Libra. °	Nona- gesime. °	Cusp 10. Scorpio. °	Nona- gesime. °
0	23 ^m 27	0	19 ^m 34
1	24 17	1	20 30
2	25 7	2	21 27
3	25 57	3	22 24
4	26 47	4	23 22
5	27 38	5	24 20
6	28 28	6	25 18
7	29 18	7	26 17
8	0 ^m 9	8	27 16
9	1 0	9	28 16
10	1 51	10	29 17
11	2 42	11	0 ^m 18
12	3 34	12	1 19
13	4 25	13	2 21
14	5 16	14	3 23
15	6 7	15	4 25
16	6 59	16	5 28
17	7 51	17	6 31
18	8 43	18	7 35
19	9 36	19	8 40
20	10 29	20	9 45
21	11 22	21	10 51
22	12 15	22	11 57
23	13 7	23	13 4
24	14 3	24	14 12
25	14 58	25	15 10
26	15 53	26	16 28
27	16 48	27	17 37
28	17 43	28	18 46
29	18 38	29	19 56
30	19 34	30	21 7

The Table of the Nonagesime Degree, for the Latitude of
16 Degrees, continued.

Cusp 10. Sagittary	Nonage- sime.	Cusp 10. Capricorn	Nonage- sime.
0	21 11 7	0	0 VS 0
1	22 18	1	1 21
2	23 30	2	2 45
3	24 43	3	4 5
4	25 56	4	5 26
5	27 12	5	6 47
6	28 14	6	8 8
7	29 39	7	9 28
8	0 54	8	10 49
9	2 10	9	12 10
10	3 26	10	13 31
11	4 42	11	14 51
12	5 58	12	16 10
13	7 15	13	17 30
14	8 33	14	18 49
15	9 52	15	20 8
16	11 11	16	21 27
17	12 30	17	22 45
18	13 50	18	24 2
19	15 10	19	25 19
20	16 30	20	26 36
21	17 51	21	27 52
22	19 11	22	29 7
23	20 32	23	0 22
24	21 53	24	1 36
25	23 13	25	2 50
26	24 34	26	4 4
27	25 55	27	5 17
28	27 16	28	6 30
29	28 58	29	7 42
30	0 VS 0	30	8 53

The Table of the Nonagesime Degree, for the Latitude of
16 Degrees, continu'd.

Cusp 10. <i>Aquarius</i>	Nona- gesime.	Cusp 10. <i>Pisces.</i>	Nona- gesime.
0	8 53	0	10 26
1	10 5	1	11 22
2	11 13	2	12 17
3	12 22	3	13 12
4	13 31	4	14 7
5	14 40	5	15 2
6	15 48	6	15 56
7	16 55	7	16 51
8	18 2	8	17 45
9	19 8	9	18 39
10	20 14	10	19 32
11	21 19	11	20 25
12	22 24	12	21 17
13	23 28	13	22 9
14	24 31	14	23 1
15	25 34	15	23 53
16	26 37	16	24 44
17	27 39	17	25 36
18	28 41	18	26 27
19	29 42	19	27 18
20	0 42	20	28 9
21	1 43	21	29 0
22	2 43	22	29 51
23	3 42	23	0 42
24	4 41	24	1 32
25	5 40	25	2 22
26	6 38	26	3 13
27	7 36	27	4 3
28	8 33	28	4 53
29	9 30	29	5 43
30	10 26	30	6 33

A Table of the Nonagesime Degree, for the Latitude of 20 Degrees.

Cusp 10. Aries. °	Nona- gesime, °	Cusp 10. Taurus. °	Nona- gesime, °
0	8 19	0	3 2
1	9 11	1	3 53
2	9 57	2	4 44
3	10 47	3	5 35
4	11 36	4	6 27
5	12 25	5	7 18
6	13 14	6	8 10
7	14 3	7	9 1
8	14 52	8	9 54
9	15 41	9	10 46
10	16 30	10	11 38
11	17 19	11	12 30
12	18 8	12	13 23
13	18 57	13	14 16
14	19 46	14	15 10
15	20 35	15	16 4
16	21 24	16	16 58
17	22 13	17	17 52
18	23 3	18	18 46
19	24 52	19	19 40
20	24 41	20	20 34
21	25 31	21	21 30
22	26 21	22	22 25
23	27 10	23	23 21
24	28 0	24	24 17
25	28 50	25	25 13
26	29 40	26	26 9
27	0 31	27	27 6
28	1 21	28	28 3
29	2 11	29	29 0
30	3 2	30	29 57

The Table of the Nonagesime Degree, for the Latitude of
20 Degrees, continued.

Cusp 10. Gemini. °	Nona- gesime. °	Cusp 10. Cancer. °	Nona- gesime. °
0	29 57	0	0 0
1	0 55	1	1 2
2	1 52	2	2 4
3	2 50	3	3 6
4	3 48	4	4 8
5	4 47	5	5 9
6	5 45	6	6 10
7	6 44	7	7 12
8	7 43	8	8 13
9	8 42	9	9 14
10	9 42	10	10 15
11	10 41	11	11 16
12	11 41	12	12 17
13	12 41	13	13 18
14	13 41	14	14 19
15	14 41	15	15 19
16	15 42	16	16 19
17	16 42	17	17 19
18	17 43	18	18 19
19	18 44	19	19 19
20	19 45	20	20 18
21	20 47	21	21 18
22	21 48	22	22 17
23	22 49	23	23 17
24	23 50	24	24 15
25	24 52	25	25 14
26	25 53	26	26 13
27	26 55	27	27 10
28	27 56	28	28 8
29	28 58	29	29 6
30	0 0	30	0 3

The Table of the Nonagesime Degree, for the Latitude of
20 Degrees, continued.

Cusp 10. Leo.	Nonage- sime.	Cusp 10. Virgo.	Nonage- sime.
0	0 3	0	27 0
1	1 0	1	27 51
2	1 57	2	28 40
3	2 54	3	29 30
4	3 50	4	0 20
5	4 45	5	1 12
6	5 43	6	2 0
7	6 39	7	2 50
8	7 34	8	3 39
9	8 30	9	4 29
10	9 24	10	5 19
11	10 20	11	6 8
12	11 14	12	6 57
13	12 9	13	7 47
14	13 3	14	8 37
15	13 57	15	9 26
16	14 50	16	10 15
17	15 43	17	11 4
18	16 36	18	11 52
19	17 29	19	12 41
20	18 22	20	13 30
21	19 14	21	14 19
22	20 6	22	15 8
23	20 58	23	15 57
24	21 51	24	16 46
25	22 43	25	17 35
26	23 34	26	18 24
27	24 26	27	19 13
28	25 17	28	20 2
29	26 8	29	20 52
30	27 0	30	21 41

The Table of the Nonagesime Degree, for the Latitude of
20 Degrees, continued.

Cusp 10. Libra.	Nonage- sime.	Cusp 10. Scorpio.	Nonage- sime.
0	21 41	0	17 43
1	22 31	1	18 39
2	23 20	2	19 36
3	24 10	3	20 34
4	25 1	4	21 32
5	25 50	5	22 30
6	26 39	6	23 29
7	27 29	7	24 28
8	28 20	8	25 27
9	29 10	9	26 28
10	0 1	10	27 30
11	0 51	11	28 31
12	1 43	12	29 33
13	2 34	13	0 35
14	3 25	14	1 38
15	4 16	15	2 41
16	5 7	16	3 44
17	5 59	17	4 48
18	6 51	18	5 53
19	7 44	19	6 59
20	8 37	20	8 5
21	9 30	21	9 12
22	10 23	22	10 20
23	11 17	23	11 28
24	12 11	24	12 38
25	13 6	25	13 47
26	14 1	26	14 57
27	14 56	27	16 8
28	15 51	28	17 19
29	16 47	29	18 30
30	17 43	30	19 43

The Table of the Nonagesime Degree, for the Latitude of
20 Degrees, continu'd.

Cusp 10. Sagittary °	Nonage- sime, °	Cusp 10. Capricorn °	Nonage- sime, °
0	19M 43	0	0 VS 0
1	20 56	1	1 25
2	22 10	2	2 51
3	23 24	3	4 16
4	24 32	4	5 41
5	25 55	5	7 5
6	27 11	6	8 29
7	28 28	7	9 53
8	29 46	8	11 17
9	1 4	9	12 41
10	2 22	10	14 2
11	3 41	11	15 29
12	5 1	12	16 51
13	6 21	13	18 14
14	7 42	14	19 36
15	9 3	15	20 58
16	10 25	16	22 19
17	11 47	17	23 40
18	13 10	18	25 0
19	14 33	19	26 19
20	15 56	20	27 39
21	17 20	21	28 57
22	18 44	22	0 15
23	20 8	23	1 33
24	21 32	24	2 49
25	22 56	25	4 5
26	24 20	26	5 21
27	25 45	27	6 36
28	27 10	28	7 51
29	28 35	29	9 5
30	0 VS 0	30	10 18

The Table of the Nonagesime Degree, for the Latitude of
20 Degrees, continued.

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Cusp 10. <i>Aquarius</i>	Nonage- sime.	Cusp 10. <i>Pisces.</i>	Nonage- sime.
0	10 [☿] 18	0	12 [♄] 18
1	11 30	1	13 14
2	12 41	2	14 9
3	13 53	3	15 5
4	15 3	4	16 0
5	16 13	5	16 55
6	17 22	6	17 49
7	18 31	7	18 43
8	19 39	8	19 37
9	20 46	9	20 31
10	21 53	10	21 24
11	23 0	11	22 17
12	24 6	12	23 9
13	25 11	13	24 1
14	26 16	14	24 53
15	27 20	15	25 45
16	28 23	16	26 36
17	29 26	17	27 27
18	0 [♄] 28	18	28 18
19	1 30	19	29 9
20	2 31	20	0 [♄] 0
21	3 32	21	0 50
22	4 32	22	1 41
23	5 31	23	2 31
24	6 30	24	3 21
25	7 30	25	4 11
26	8 28	26	5 1
27	9 27	27	5 51
28	10 24	28	6 40
29	11 21	29	7 30
30	12 18	30	8 19

A Table of the Nongefime Degree, for the Latitude of 24 Degrees.

Cusp 10. Aries.	Nona- gefime.	Cusp 10. Taurus.	Nona- gefime.
0	10 5	0	4 28
1	10 54	1	5 18
2	11 42	2	6 9
3	12 31	3	6 59
4	13 20	4	7 50
5	14 8	5	8 40
6	14 57	6	9 31
7	15 45	7	10 21
8	16 34	8	11 12
9	17 22	9	12 3
10	18 11	10	12 54
11	18 59	11	13 45
12	19 48	12	14 37
13	20 36	13	15 29
14	21 25	14	16 22
15	22 13	15	17 15
16	23 2	16	18 8
17	23 50	17	19 1
18	24 39	18	19 54
19	25 28	19	20 47
20	26 16	20	21 41
21	27 5	21	22 34
22	27 54	22	23 28
23	28 43	23	24 22
24	29 32	24	25 16
25	0 21	25	26 10
26	1 10	26	27 5
27	2 0	27	28 0
28	2 49	28	28 56
29	3 39	29	29 52
30	4 28	30	0 48

The Table of the Nonagesime Degree, for the Latitude of
24 Degrees, continu'd.

Cusp 10. Gemini.	Nonage- sime.	Cusp 16. Cancer.	Nonage- sime.
0	0 48	0	0 50
1	1 44	1	1 0
2	2 40	2	2 0
3	3 36	3	3 0
4	4 33	4	4 0
5	5 30	5	4 59
6	6 27	6	5 59
7	7 24	7	6 59
8	8 21	8	7 58
9	9 19	9	8 57
10	10 17	10	9 57
11	11 15	11	10 56
12	12 13	12	11 55
13	13 11	13	12 54
14	14 9	14	13 53
15	15 8	15	14 52
16	16 7	16	15 50
17	17 6	17	16 49
18	18 5	18	17 47
19	19 4	19	18 45
20	20 3	20	19 43
21	21 3	21	20 41
22	22 2	22	21 39
23	23 1	23	22 37
24	24 1	24	23 34
25	25 1	25	24 31
26	26 0	26	25 28
27	27 0	27	26 24
28	28 0	28	27 20
29	29 0	29	28 16
30	0 50	30	29 12

The Table of the Nonagesime Degree for the Latitude of
24 Degrees, continued.

Cusp 10. Leo.	Nonage- sime.	Cusp 10. Virgo.	Nonage- sime.
0	29 12	0	25 32
1	0 8	1	26 22
2	1 4	2	27 11
3	1 59	3	28 1
4	2 54	4	28 50
5	3 49	5	29 39
6	4 44	6	2 12 28
7	5 38	7	1 17
8	6 32	8	2 6
9	7 26	9	2 55
10	8 19	10	3 44
11	9 13	11	4 33
12	10 6	12	5 21
13	10 59	13	6 10
14	11 52	14	6 59
15	12 45	15	7 48
16	13 38	16	8 36
17	14 30	17	9 24
18	15 22	18	10 11
19	16 14	19	11 0
20	17 6	20	11 48
21	17 57	21	12 36
22	18 48	22	13 24
23	19 39	23	14 13
24	20 30	24	15 2
25	21 21	25	15 50
26	22 11	26	16 39
27	23 2	27	17 28
28	23 52	28	18 17
29	24 42	29	19 6
30	25 32	30	19 55

The Table of the Nonagesime Degree, for the Latitude of 24 Degrees, continued.

Cusp 10 Libra. °	Nona- getime. °	Cusp 10 Scorpio °	Nona- getime. °
0	19 ¹¹ 55	0	15 ² 51
1	20 44	1	16 48
2	21 33	2	17 45
3	22 22	3	18 43
4	23 15	4	19 41
5	24 1	5	20 40
6	24 50	6	21 39
7	25 40	7	22 39
8	26 30	8	23 39
9	27 20	9	24 40
10	28 10	10	25 42
11	29 0	11	26 44
12	29 51	12	27 46
13	30 42	13	28 49
14	1 33	14	29 52
15	2 24	15	30 56
16	3 15	16	1 0
17	4 7	17	2 5
18	4 59	18	3 11
19	5 52	19	4 18
20	6 45	20	5 25
21	7 38	21	6 33
22	8 31	22	7 42
23	9 25	23	8 52
24	10 19	24	10 3
25	11 13	25	11 14
26	12 8	26	12 16
27	13 3	27	13 18
28	13 59	28	14 21
29	14 55	29	15 24
30	15 51	30	16 28

The Table of the Nonagesime Degree for the Latitude of
24 Degrees, continued.

Cusp 10. Sagittary °	Non- agesime. °	Cusp 10. Capricorn °	Non- agesime. °
0	18 18	0	0 VS 0
1	19 33	1	1 29
2	20 49	2	2 58
3	22 8 5	3	4 27
4	23 22	4	5 55
5	24 40	5	7 23
6	25 58	6	8 50
7	27 17	7	10 18
8	28 37	8	11 49
9	29 57	9	13 12
10	1 18	10	14 33
11	2 40	11	16 6
12	4 3	12	17 32
13	5 26	13	18 58
14	6 50	14	20 23
15	8 14	15	21 47
16	9 38	16	23 11
17	11 3	17	24 34
18	12 29	18	25 57
19	13 55	19	27 19
20	15 22	20	28 41
21	16 49	21	0 2
22	18 16	22	1 23
23	19 43	23	2 43
24	21 10	24	4 2
25	22 38	25	5 20
26	24 16	26	6 38
27	25 35	27	7 55
28	27 3	28	9 12
29	28 32	29	10 28
30	0 VS 10	30	11 43

The Table of the Nonagesime Degree for the Latitude of 24 Degrees, continued.

Culp 10. Aquarius °	Nonage- sime. °	Culp 10. Pisces. °	Nonage- sime. °
0	11 43	0	14 9
1	12 57	1	15 5
2	14 10	2	16 1
3	15 23	3	16 57
4	16 35	4	17 52
5	17 46	5	18 47
6	18 56	6	19 41
7	20 6	7	20 35
8	21 15	8	21 29
9	22 24	9	22 23
10	23 32	10	23 16
11	24 40	11	24 9
12	25 47	12	25 1
13	26 54	13	25 53
14	28 0	14	26 45
15	29 5	15	27 36
16	0 9	16	28 27
17	1 12	17	29 18
18	2 15	18	0 9
19	3 17	19	1 0
20	4 19	20	1 50
21	5 20	21	2 40
22	6 20	22	3 30
23	7 20	23	4 20
24	8 19	24	5 9
25	9 19	25	5 59
26	10 28	26	6 49
27	11 17	27	7 38
28	12 15	28	8 27
29	13 12	29	9 16
30	14 9	30	10 5

A Table of the Nonagesime Degree, for the Latitude of 30 Degrees.

Cusp 10. Aries.	Nonagesime.	Cusp 10. Taurus.	Nonagesime.
0	12 59	0	6 54
1	13 47	1	7 32
2	14 35	2	8 20
3	15 23	3	9 9
4	16 10	4	9 58
5	16 58	5	10 47
6	17 45	6	11 36
7	18 32	7	12 26
8	19 19	8	13 15
9	20 6	9	14 5
10	20 54	10	14 55
11	21 41	11	15 45
12	22 28	12	16 35
13	23 16	13	17 25
14	24 3	14	18 15
15	24 50	15	19 6
16	25 37	16	19 56
17	26 25	17	20 47
18	27 12	18	21 38
19	27 59	19	22 29
20	28 46	20	23 21
21	29 34	21	24 12
22	0 21	22	25 4
23	1 8	23	25 56
24	1 56	24	26 48
25	2 44	25	27 41
26	3 32	26	28 34
27	4 20	27	29 26
28	5 8	28	0 19
29	5 56	29	1 12
30	6 44	30	2 6

The Table of the Nonagesime Degree, for the Latitude of
30 Degrees, continu'd.

Cusp 10. Gemini. °	Nonage- sime. °		Cusp 10. Cancer. °	Nonage- sime. °	
0	2	II 6	0	0	♄ 0
1	2	59	1	0	57
2	3	53	2	1	55
3	4	47	3	2	52
4	5	41	4	3	49
5	6	35	5	4	46
6	7	30	6	5	43
7	8	25	7	6	40
8	9	20	8	7	36
9	10	15	9	8	33
10	11	10	10	9	29
11	12	6	11	10	26
12	13	1	12	11	22
13	13	57	13	12	18
14	14	53	14	13	15
15	15	49	15	14	11
16	16	46	16	15	7
17	17	42	17	16	3
18	18	38	18	16	59
19	19	35	19	17	54
20	20	31	20	18	50
21	21	27	21	19	45
22	22	24	22	20	40
23	23	20	23	21	35
24	24	17	24	22	30
25	25	14	25	23	24
26	26	11	26	24	18
27	27	8	27	25	12
28	28	5	28	26	6
29	29	3	29	27	0
30	0	♄ 0	30	27	54

The Table of the Nonagesima Degree, for the Latitude of 30 Degrees, continued.

Cusp 10. Leo	Nonage- sime.	Cusp 10. Virgo	Nonage- sime.
0	27 54	0	23 15
1	28 47	1	24 4
2	29 41	2	24 52
3	0 34	3	25 40
4	1 27	4	26 28
5	2 20	5	27 16
6	3 12	6	28 4
7	4 5	7	28 52
8	4 57	8	29 39
9	5 49	9	0 27
10	6 40	10	1 15
11	7 32	11	2 2
12	8 23	12	2 50
13	9 14	13	3 37
14	10 5	14	4 24
15	10 56	15	5 11
16	11 47	16	5 58
17	12 37	17	6 45
18	13 27	18	7 32
19	14 17	19	8 19
20	15 6	20	9 6
21	15 56	21	9 53
22	16 45	22	10 40
23	17 35	23	11 28
24	18 24	24	12 15
25	19 13	25	13 2
26	20 2	26	13 50
27	20 51	27	14 38
28	21 39	28	15 25
29	22 37	29	16 13
30	23 15	30	17 1

The Table of the Nonagesime Degree, for the Latitude of 30 Degrees, continued.

Cusp 10. Libra.	Nonagesime.	Cusp 10. Scorpio.	Nonagesime.
0	17 1	0	12 40
1	17 49	1	13 37
2	18 37	2	14 34
3	19 25	3	15 32
4	20 13	4	16 30
5	21 2	5	17 29
6	21 50	6	18 28
7	22 39	7	19 28
8	23 28	8	20 28
9	24 17	9	21 29
10	25 7	10	22 31
11	25 56	11	23 33
12	26 46	12	24 36
13	27 36	13	25 40
14	28 27	14	26 44
15	29 18	15	27 49
16	0 9	16	28 55
17	1 0	17	0 2
18	1 52	18	1 9
19	2 44	19	2 17
20	3 36	20	3 26
21	4 29	21	4 36
22	5 22	22	5 47
23	6 15	23	6 58
24	7 9	24	8 10
25	8 3	25	9 23
26	8 58	26	10 37
27	9 53	27	11 51
28	10 48	28	13 6
29	11 44	29	14 23
30	12 40	30	15 40

The Table of the Nonagesime Degree, for the Latitude of
30 Degrees, continued.

Cusp 10. Sagittary	Nonage- sime.e.	Cusp 10. Capricorn	Nonage- sime.
0	15 11 50	0	0 VS 0
1	16 58	1	1 36
2	18 17	2	3 12
3	19 37	3	4 47
4	20 58	4	6 22
5	22 10	5	7 56
6	23 42	6	9 30
7	25 5	7	11 4
8	26 28	8	12 37
9	27 53	9	14 11
10	29 19	10	15 44
11	0 45	11	17 16
12	2 12	12	18 48
13	3 40	13	20 19
14	5 9	14	21 50
15	7 39	15	23 20
16	8 10	16	24 50
17	9 41	17	26 19
18	11 12	18	27 47
19	12 44	19	29 15
20	14 16	20	0 42
21	15 49	21	2 8
22	17 22	22	3 33
23	18 56	23	4 57
24	20 30	24	6 20
25	22 5	25	7 42
26	23 40	26	9 3
27	25 15	27	10 23
28	26 50	28	11 42
29	28 5	29	13 1
30	0 VS 0	30	14 20

The Table of the Nonagesime Degree, for the Latitude of
30 Degrees, continued.

Cusp 10. <i>Aquarius</i>	Nonage- sime.	Cusp 10. <i>Pisces</i>	Nonage- sime.
0	14 20	0	17 20
1	15 38	1	18 16
2	16 54	2	19 12
3	18 9	3	20 7
4	19 23	4	21 4
5	20 37	5	21 37
6	21 50	6	22 51
7	23 2	7	23 45
8	24 14	8	24 38
9	25 25	9	25 31
10	26 35	10	26 24
11	27 44	11	27 16
12	28 51	12	28 8
13	29 58	13	29 0
14	1 4	14	29 51
15	2 10	15	0 42
16	3 15	16	1 32
17	4 19	17	2 22
18	5 23	18	3 12
19	6 26	19	4 2
20	7 29	20	4 52
21	8 31	21	5 41
22	9 32	22	6 31
23	10 33	23	7 20
24	11 33	24	8 10
25	12 32	25	8 58
26	13 31	26	9 47
27	14 29	27	10 35
28	15 27	28	11 23
29	16 24	29	12 11
30	17 20	30	12 59

The Table of the Nonagesime Degree, for the Latitude of
34 Degrees.

Bas

Cusp 10. Aries.	Nonage- sime.	Cusp 10. Taurus.	Nonage- sime.
0	15 4	0	8 18
1	15 51	1	9 5
2	16 38	2	9 53
3	17 24	3	10 40
4	18 10	4	11 28
5	18 57	5	12 15
6	19 44	6	13 3
7	20 30	7	13 51
8	21 46	8	14 39
9	22 2	9	15 27
10	22 49	10	16 15
11	23 35	11	17 3
12	24 22	12	17 52
13	25 8	13	18 41
14	25 54	14	19 30
15	26 40	15	20 19
16	27 26	16	21 9
17	28 12	17	21 58
18	28 59	18	22 48
19	29 45	19	23 38
20	0 32	20	24 28
21	1 18	21	25 18
22	2 4	22	26 9
23	2 51	23	26 59
24	3 37	24	27 50
25	4 24	25	28 41
26	5 11	26	29 32
27	5 58	27	0 23
28	6 45	28	1 14
29	7 31	29	2 6
30	8 18	30	2 58

The Table of the Nonagesime Degree, for the Latitude of
34 Degrees, continued.

Cusp 10. Gemini. °	Nonage- sime. °	Cusp 10. Cancer. °	Nonage- sime. °
0	2 11 58	0	0 50 0
1	3 50	1	0 55
2	4 42	2	1 50
3	5 35	3	2 46
4	6 27	4	3 41
5	7 20	5	4 36
6	8 13	6	5 31
7	9 6	7	6 26
8	10 0	8	7 21
9	10 53	9	8 16
10	11 47	10	9 11
11	12 40	11	10 6
12	13 34	12	11 0
13	14 28	13	11 55
14	15 22	14	12 49
15	16 16	15	13 43
16	17 11	16	14 37
17	18 5	17	15 31
18	19 0	18	16 25
19	19 55	19	17 19
20	20 50	20	18 13
21	21 44	21	19 7
22	22 39	22	20 1
23	23 34	23	20 54
24	24 29	24	21 47
25	25 24	25	22 40
26	26 19	26	23 32
27	27 14	27	24 25
28	28 9	28	25 17
29	29 5	29	26 9
30	0 50 0	30	27 1

The Table of the Nonagesime Degree, for the Latitude of
34 Degrees, continu'd.

Cusp 107 Leo.	Nona- ge time.	Cusp 10 Virgo.	Nona- ge time.
00	027 51	00	218 42
01	027 153	01	22 29
02	128 45	02	23 16
03	129 37	03	24 2
04	20 28	04	24 49
05	1 19	05	25 36
06	12 10	06	26 23
07	03 1	07	27 10
08	13 52	08	27 56
09	24 42	09	28 43
10	35 32	10	29 29
11	16 22	11	0 15
12	17 12	12	1 2
13	18 2	13	1 48
14	18 51	14	2 34
15	19 41	15	3 20
16	110 30	16	4 6
17	11 19	17	4 52
18	12 8	18	5 38
19	12 57	19	6 24
20	13 45	20	7 11
21	14 34	21	7 57
22	15 22	22	8 43
23	16 10	23	9 30
24	16 57	24	10 16
25	17 45	25	11 3
26	18 32	26	11 50
27	19 20	27	12 36
28	20 7	28	13 23
29	20 55	29	14 9
30	21 42	30	14 56

The Table of the Nonagesime Degree, for the Latitude of
34 Degrees, continu'd.

Cusp 10. Libra.	Nonagesime.	Cusp 10. Scorpio.	Nonagesime.
0	14 56	0	10 14
1	15 43	1	11 11
2	16 30	2	12 8
3	17 17	3	13 5
4	18 4	4	14 3
5	18 52	5	15 1
6	19 40	6	16 0
7	20 28	7	17 0
8	21 16	8	18 1
9	22 5	9	19 3
10	22 54	10	20 4
11	23 43	11	21 8
12	24 32	12	22 11
13	25 21	13	23 15
14	26 11	14	24 20
15	27 1	15	25 26
16	27 51	16	26 32
17	28 42	17	27 39
18	29 33	18	28 47
19	0 24	19	29 56
20	1 16	20	1 5
21	2 8	21	2 16
22	3 0	22	3 28
23	3 53	23	4 40
24	4 46	24	5 54
25	5 39	25	7 9
26	6 33	26	8 24
27	7 27	27	9 40
28	8 22	28	10 56
29	9 18	29	12 13
30	10 14	30	13 21

The Table of the Nonagesimo Degree, for the Latitude of
34 Degrees, continu'd.

Cusp 10. Sagittary °	Nonage- sime. °	Cusp 10. Capricorn °	Nonage- sime. °
0	13 31	0	0 VS 0
1	14 51	1	1 42
2	16 13	2	3 23
3	17 36	3	5 4
4	19 0	4	6 45
5	20 24	5	8 25
6	21 49	6	10 5
7	23 15	7	11 44
8	24 42	8	13 23
9	26 10	9	15 2
10	27 39	10	16 40
11	29 9	11	18 17
12	0 40	12	19 54
13	2 12	13	21 30
14	3 45	14	23 6
15	5 19	15	24 41
16	6 54	16	26 15
17	8 30	17	27 48
18	10 6	18	29 20
19	11 43	19	0 50
20	13 21	20	2 20
21	15 0	21	3 49
22	16 39	22	5 17
23	18 18	23	6 44
24	19 57	24	8 10
25	21 37	25	9 35
26	23 17	26	11 0
27	24 57	27	12 24
28	26 38	28	13 47
29	28 19	29	15 9
30	0 VS 0	30	16 29

The Table of the Nonagesime Degree, for the Latitude of
34 Degrees, continued.

Cusp 10. <i>Aquarius</i> Q	Nonage- sime. o	Cusp 10. <i>Pisces</i> o	Nonage- sime. o
0	16 29	0	19 46
1	17 48	1	20 42
2	19 6	2	21 37
3	20 22	3	22 32
4	21 37	4	23 27
5	22 52	5	24 21
6	24 6	6	25 15
7	25 20	7	26 8
8	26 32	8	27 0
9	27 44	9	27 52
10	28 55	10	28 44
11	0 5	11	29 36
12	1 14	12	0 27
13	2 22	13	1 18
14	3 29	14	2 8
15	4 35	15	2 59
16	5 41	16	3 49
17	6 46	17	4 39
18	7 50	18	5 28
19	8 53	19	6 18
20	9 55	20	7 7
21	10 57	21	7 55
22	11 58	22	8 43
23	12 59	23	9 31
24	13 59	24	10 19
25	14 58	25	11 7
26	15 57	26	11 55
27	16 55	27	12 43
28	17 52	28	13 31
29	18 49	29	14 18
30	19 46	30	15 4

A Table of the Nonagesime Degree for the Latitude of
37 Degrees.

Cusp 10. Aries.	Nonagesime.	Cusp 10. Taurus.	Nonagesime.
0	16 45	0	9 33
1	17 31	1	10 19
2	18 17	2	11 6
3	19 3	3	11 52
4	19 49	4	12 38
5	20 34	5	13 25
6	21 20	6	14 11
7	22 6	7	14 58
8	22 51	8	15 41
9	23 57	9	16 31
10	24 23	10	17 20
11	25 8	11	18 7
12	25 53	12	18 35
13	26 59	13	19 43
14	27 24	14	20 31
15	28 9	15	21 18
16	28 55	16	22 6
17	29 40	17	22 55
18	0 25	18	23 44
19	1 10	19	24 32
20	1 55	20	25 21
21	2 41	21	26 10
22	3 26	22	27 0
23	4 12	23	27 49
24	4 58	24	28 39
25	5 43	25	29 28
26	6 29	26	0 18
27	7 15	27	1 9
28	8 1	28	1 59
29	8 47	29	2 49
30	9 33	30	3 40

The Table of the Nonagesime Degree, for the Latitude of
37 Degrees, continued.

Cusp 10. Gemini.	Non- agesime.	Cusp 10. Cancer.	Non- agesime.
0	3 11 40	0	0 06 0
1	4 31	1	0 54
2	5 22	2	1 48
3	6 13	3	2 41
4	7 4	4	3 35
5	7 55	5	4 29
6	8 46	6	5 23
7	9 38	7	6 17
8	10 30	8	7 10
9	11 22	9	8 4
10	12 14	10	8 57
11	13 6	11	9 50
12	13 59	12	10 43
13	14 52	13	11 36
14	15 44	14	12 29
15	16 37	15	13 23
16	17 31	16	14 16
17	18 24	17	15 8
18	19 17	18	16 1
19	20 10	19	16 54
20	21 3	20	17 46
21	21 56	21	18 38
22	22 50	22	19 30
23	23 43	23	20 22
24	24 37	24	21 14
25	25 31	25	22 5
26	26 23	26	22 56
27	27 19	27	23 47
28	28 12	28	24 38
29	29 6	29	25 29
30	0 0 0	30	26 20

The Table of the Nonagesime Degree, for the Latitude of
37 Degrees, continued.

Cusp 10. Leo	Nonage- sime.	Cusp 10. Virgo	Nonage- sime.
0	26 30	0	20 27
1	27 11	1	21 13
2	28 1	2	21 39
3	28 51	3	22 45
4	29 42	4	23 31
5	0 32	5	24 17
6	1 21	6	25 2
7	2 11	7	25 48
8	3 0	8	26 34
9	3 50	9	27 19
10	4 39	10	28 5
11	5 28	11	28 50
12	6 16	12	29 35
13	7 5	13	0 20
14	7 54	14	1 5
15	8 42	15	1 51
16	9 29	16	2 36
17	10 17	17	3 21
18	11 5	18	4 7
19	11 52	19	4 52
20	12 42	20	5 37
21	13 28	21	6 23
22	14 15	22	7 9
23	15 2	23	7 54
24	15 49	24	8 40
25	16 35	25	9 26
26	17 22	26	10 11
27	18 8	27	10 57
28	18 54	28	11 43
29	19 41	29	12 29
30	20 27	30	13 15

The Table of the Nonagesime Degree, for the Latitude of
37 Degrees, continued.

Cusp 10. Libra. °	Nonage- sime.	Cusp 10. Scorpio. °	Nonage- sime.
0	13 15	0	8 15
1	14 2	1	9 11
2	14 48	2	10 8
3	15 34	3	11 5
4	16 21	4	12 3
5	17 8	5	13 1
6	17 55	6	14 0
7	18 43	7	15 0
8	19 31	8	16 0
9	20 19	9	17 1
10	21 7	10	18 3
11	21 55	11	19 5
12	22 44	12	20 8
13	23 33	13	21 12
14	24 22	14	22 17
15	25 11	15	23 23
16	26 1	16	24 30
17	26 50	17	25 28
18	27 40	18	26 46
19	28 30	19	27 55
20	29 21	20	29 5
21	0 12	21	0 16
22	1 4	22	1 28
23	1 56	23	2 41
24	2 49	24	3 55
25	3 42	25	5 10
26	4 36	26	6 26
27	5 30	27	7 44
28	6 25	28	9 3
29	7 20	29	10 23
30	8 15	30	11 43

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A Table of the Nonagesima Degree, for the Latitude of 37 Degrees, continued.

Cusp 10. Sagittary	Nonage- sime.	Cusp 10. Capricorn	Nonage- sime.
0	11 43	0	0 0
1	13 4	1	1 46
2	14 26	2	3 32
3	15 50	3	5 18
4	17 15	4	7 4
5	18 42	5	8 50
6	20 10	6	10 35
7	21 39	7	12 20
8	23 9	8	14 1
9	24 40	9	15 47
10	26 12	10	17 29
11	27 46	11	19 11
12	29 21	12	20 52
13	0 56	13	22 32
14	2 32	14	24 11
15	4 10	15	25 50
16	5 49	16	27 28
17	7 28	17	28 4
18	9 8	18	0 39
19	10 49	19	2 14
20	12 31	20	3 48
21	14 23	21	5 20
22	15 56	22	6 51
23	17 40	23	8 21
24	19 25	24	9 50
25	21 10	25	11 18
26	22 56	26	12 45
27	24 42	27	14 10
28	26 38	28	15 34
29	28 14	29	16 56
30	0 0	30	18 17

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The Table of the Nonagesime Degree for the Latitude of 37 Degrees, continued.

Cusp 10. Aquarius	Nonagesime.	Cusp 10. Pisces.	Nonagesime.
0	18 17	0	21 45
1	19 37	1	22 40
2	20 57	2	23 35
3	22 16	3	24 30
4	23 34	4	25 24
5	24 50	5	26 18
6	26 5	6	27 11
7	27 19	7	28 4
8	28 32	8	28 56
9	29 44	9	29 48
10	0 55	10	0 39
11	2 5	11	1 30
12	3 14	12	2 30
13	4 22	13	3 20
14	5 30	14	3 59
15	6 37	15	4 49
16	7 43	16	5 38
17	8 48	17	6 27
18	9 52	18	7 16
19	10 55	19	8 5
20	11 57	20	8 53
21	12 59	21	9 41
22	14 0	22	10 29
23	15 0	23	11 17
24	16 0	24	12 5
25	16 59	25	12 52
26	17 57	26	13 39
27	18 55	27	14 26
28	19 52	28	15 12
29	20 48	29	15 58
30	21 45	30	16 45

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Table of the Nonagesime Degree, for the Latitude of 40 Degrees.

<i>Est</i>		<i>Nas</i>	
Cusp 10. <i>Aries.</i>	Nonagefine.	Cusp 10. <i>Taurus.</i>	Nonagefine.
0	18 31	0	10 51
1	19 16	1	11 36
2	20 1	2	12 21
3	20 46	3	13 6
4	21 31	4	13 51
5	22 16	5	14 37
6	23 1	6	15 22
7	23 45	7	16 8
8	24 30	8	16 54
9	25 15	9	17 40
10	25 59	10	18 26
11	26 44	11	19 13
12	27 28	12	19 59
13	28 12	13	20 46
14	28 57	14	21 32
15	29 41	15	22 19
16	0 15	16	23 6
17	1 10	17	23 53
18	1 54	18	24 41
19	2 38	19	25 29
20	3 23	20	26 17
21	4 7	21	27 5
22	4 51	22	27 53
23	5 36	23	28 41
24	6 21	24	29 29
25	7 6	25	0 18
26	7 51	26	1 6
27	8 36	27	1 55
28	9 21	28	2 44
29	10 6	29	3 33
30	10 51	30	4 22

The Table of the Nonagesime Degree, for the Latitude of 40 Degrees, continu'd.

Cusp 10. Gemini. °	Nonage- sime. °		Cusp 10. Cancer. °	Nonage- sime. °	
0	4	II 22	0	0	5 0
1	5	11	1	0	13
2	6	I	2	1	45
3	6	51	3	2	37
4	7	41	4	3	30
5	8	31	5	4	22
6	9	21	6	5	14
7	10	12	7	6	7
8	11	3	8	6	59
9	11	53	9	7	51
10	12	44	10	8	43
11	13	35	11	9	34
12	14	26	12	10	26
13	15	17	13	11	18
14	16	8	14	12	10
15	16	59	15	13	1
16	17	50	16	13	52
17	18	42	17	14	43
18	19	34	18	15	34
19	20	26	19	16	25
20	21	17	20	17	16
21	22	9	21	18	7
22	23	1	22	18	57
23	23	53	23	19	41
24	24	46	24	20	39
25	25	38	25	21	29
26	26	30	26	22	19
27	27	23	27	23	9
28	28	15	28	23	59
29	29	7	29	24	49
30	0	5 0	30	25	38

The Table of the Nonagesime Degree for the Latitude of
40 Degrees, continued.

Cusp 10. Leo.	Nonage- sime.	Cusp 10. Virgo.	Nonage- sime.
0	25 38	0	19 9
1	26 27	1	19 54
2	27 16	2	20 39
3	28 5	3	21 24
4	28 54	4	22 9
5	29 41	5	22 54
6	0 31	6	23 39
7	1 19	7	24 24
8	2 7	8	25 9
9	2 55	9	25 53
10	3 43	10	26 37
11	4 31	11	27 22
12	5 19	12	28 6
13	6 7	13	28 50
14	6 54	14	29 35
15	7 41	15	2 19
16	8 28	16	1 3
17	9 14	17	1 48
18	10 1	18	2 32
19	10 47	19	3 16
20	11 34	20	4 1
21	12 20	21	4 45
22	13 6	22	5 30
23	13 52	23	6 15
24	14 38	24	6 59
25	15 23	25	7 44
26	16 9	26	8 29
27	16 54	27	9 14
28	17 39	28	9 54
29	18 24	29	10 44
30	19 9	30	11 29

The Table of the Nonagesime Degree, for the Latitude of 40 Degrees, continued.

as *as*

Cusp 10. Libra.	Nonagesime.	Cusp 10 Scorpio	Nonagesime.
0	11 29	0	6 4
1	12 15	1	6 52
2	13 00	2	7 55
3	13 46	3	8 52
4	14 31	4	9 49
5	15 17	5	10 47
6	16 03	6	11 46
7	16 50	7	12 45
8	17 37	8	13 45
9	18 24	9	14 46
10	19 11	10	15 48
11	19 58	11	16 50
12	20 46	12	17 53
13	21 34	13	18 57
14	22 22	14	20 02
15	23 10	15	21 07
16	23 59	16	22 13
17	24 48	17	23 20
18	25 38	18	24 28
19	26 23	19	25 38
20	27 18	20	26 49
21	28 08	21	28 01
22	28 59	22	29 14
23	29 50	23	30 28
24	0 42	24	1 43
25	1 35	25	2 59
26	2 28	26	4 15
27	3 21	27	5 34
28	4 15	28	6 53
29	5 02	29	8 14
30	6 04	30	9 56

as *as*

The Table of the Nonagesime Degree, for the Latitude of
40 Degrees, continued.

Cusp 10. Sagittary	Nonage- sime.	Cusp 10. Capricorn	Nonage- sime.
0	9 m 36	0	0 vs 0
1	10 59	1	1 52
2	12 24	2	3 44
3	15 50	3	5 36
4	15 17	4	7 27
5	16 46	5	9 19
6	18 16	6	11 10
7	19 48	7	13 1
8	21 21	8	14 51
9	22 55	9	16 40
10	24 30	10	18 28
11	26 7	11	20 15
12	27 45	12	22 1
13	29 24	13	23 46
14	1 2 5	14	25 30
15	2 47	15	27 13
16	4 30	16	28 55
17	6 14	17	0 36
18	7 59	18	2 15
19	9 45	19	3 53
20	11 32	20	5 30
21	13 20	21	7 5
22	15 9	22	8 39
23	16 59	23	10 12
24	18 50	24	11 44
25	20 141	25	13 14
26	22 33	26	14 43
27	24 24	27	16 10
28	26 16	28	17 36
29	28 8	29	19 1
30	0 vs 0	30	20 24

The Table of the Nonagesime Degree, for the Latitude of
40 Degrees, continu'd.

Cusp ro. Aquarius	Nonage- sime.	Cusp ro. Pisces.	Nonage- sime.
0	20 24	0	23 56
1	21 46	1	24 51
2	23 7	2	25 45
3	24 26	3	26 39
4	25 24	4	27 32
5	27 1	5	28 25
6	28 17	6	29 18
7	29 32	7	0 10
8	0 46	8	1 01
9	1 59	9	1 52
10	3 11	10	2 44
11	4 22	11	3 37
12	5 32	12	4 27
13	6 40	13	5 17
14	7 47	14	6 01
15	8 53	15	6 50
16	9 58	16	7 38
17	11 3	17	8 26
18	12 7	18	9 14
19	13 10	19	10 02
20	14 12	20	10 49
21	15 14	21	11 36
22	16 15	22	12 20
23	17 15	23	13 10
24	18 14	24	13 57
25	19 13	25	14 43
26	20 11	26	15 29
27	21 08	27	16 14
28	22 05	28	17 0
29	23 01	29	17 49
30	23 56	30	18 31

The Table of the Nonagesime Degree, for the Latitude of 43 Degrees.

Cusp 10. Aries. °	Nona- gesime. °	Cusp 10. Taurus. °	Nona- gesime. °
0	20 24	0	12 12
1	21 8	1	12 56
2	21 52	2	13 40
3	22 36	3	14 24
4	23 20	4	15 08
5	24 4	5	15 52
6	24 48	6	16 37
7	25 31	7	17 21
8	26 15	8	18 06
9	26 59	9	18 51
10	27 42	10	19 36
11	28 26	11	20 21
12	29 9	12	21 06
13	29 52	13	21 52
14	0 35	14	22 37
15	1 19	15	23 23
16	2 2	16	24 09
17	2 45	17	24 55
18	3 29	18	25 41
19	4 12	19	26 27
20	4 55	20	27 14
21	5 39	21	28 0
22	6 23	22	28 47
23	7 6	23	29 34
24	7 49	24	0 21
25	8 33	25	1 08
26	9 17	26	1 55
27	10 01	27	2 43
28	10 45	28	3 30
29	11 28	29	4 18
30	12 12	30	5 06

The Table of the Nonagesime Degree, for the Latitude of
 43 Degrees, continued.

MR

Cusp 10. Gemini. °	Nonage- sime, °	Cusp 10, Cancer. °	Nonage- sime, °
0	5 11 6	0	0 50 0
1	5 54	1	0 51
2	6 42	2	1 41
3	7 31	3	2 32
4	8 19	4	3 23
5	9 08	5	4 14
6	9 57	6	5 05
7	10 46	7	5 56
8	11 35	8	6 46
9	12 24	9	7 36
10	13 13	10	8 26
11	14 03	11	9 16
12	14 53	12	10 06
13	15 43	13	10 57
14	16 33	14	11 47
15	17 23	15	12 37
16	18 13	16	13 27
17	19 03	17	14 17
18	19 54	18	15 07
19	20 44	19	15 57
20	21 34	20	16 47
21	22 24	21	17 35
22	23 14	22	18 25
23	24 04	23	19 14
24	24 55	24	20 03
25	25 46	25	20 52
26	26 37	26	21 41
27	27 28	27	22 29
28	28 19	28	23 18
29	29 09	29	24 06
30	0 50	30	24 54

The Table of the Nonagesime Degree, for the Latitude of
43 Degrees, continued.

Cusp 10. Leo. °	Nonage- sime °	Cusp 10. Virgo. °	Nonage- sime. °
0	24 54	0	17 48
1	25 42	1	18 32
2	26 30	2	19 15
3	27 17	3	19 59
4	28 05	4	20 45
5	28 52	5	21 27
6	29 39	6	22 11
7	0 26	7	22 54
8	1 13	8	23 37
9	2 0	9	24 21
10	2 46	10	25 05
11	3 33	11	25 48
12	4 19	12	26 31
13	5 05	13	27 15
14	5 51	14	27 58
15	6 37	15	28 41
16	7 23	16	29 25
17	8 08	17	0 08
18	8 54	18	0 51
19	9 39	19	1 34
20	10 24	20	2 18
21	11 09	21	3 01
22	11 54	22	3 45
23	12 39	23	4 29
24	13 23	24	5 12
25	14 08	25	5 56
26	14 52	26	6 40
27	15 36	27	7 24
28	16 20	28	8 08
29	17 04	29	8 52
30	17 48	30	9 36

The Table of the Nonagesime Degree, for the Latitude of
43 Degrees, continu'd.

Cusp 10. Libra.	Nonage- sime.	Cusp 10. Scorpio.	Nonage- sime.
0	9 19 36	0	3 19
1	10 21	1	4 34
2	11 06	2	5 29
3	11 51	3	6 25
4	12 35	4	7 22
5	13 20	5	8 19
6	14 05	6	9 17
7	14 50	7	10 15
8	15 36	8	11 14
9	16 22	9	12 14
10	17 08	10	13 15
11	17 54	11	14 17
12	18 41	12	15 20
13	19 21	13	16 24
14	20 14	14	17 29
15	21 01	15	18 34
16	21 49	16	19 40
17	22 37	17	20 47
18	23 25	18	21 55
19	24 14	19	23 05
20	25 03	20	24 16
21	25 53	21	25 28
22	26 43	22	26 41
23	27 33	23	27 55
24	28 24	24	29 9
25	29 15	25	0 12 5
26	0 7	26	1 42
27	0 59	27	3 1
28	1 52	28	4 22
29	2 45	29	5 44
30	3 39	30	7 8

The Table of the Nonagesime Degree, for the Latitude of
43 Degrees, continu'd.

Cusp 10. Sagittary °	Nonage- sime, °	Cusp 10. Capricorn °	Nonage- sime, °
0	7 III 8	0	0 VS 0
1	8 34	1	2 0
2	10 1	2	4 0
3	11 29	3	6 0
4	12 58	4	8 0
5	14 29	5	10 0
6	16 1	6	11 59
7	17 35	7	13 57
8	19 11	8	15 54
9	20 48	9	17 49
10	22 26	10	19 12
11	24 6	11	21 34
12	25 48	12	23 25
13	27 32	13	25 16
14	29 28	14	27 6
15	1 X 5	15	28 55
16	2 54	16	0. 42
17	4 44	17	2 28
18	6 35	18	4 12
19	8 26	19	5 54
20	10 18	20	7 34
21	12 11	21	9 12
22	14 6	22	10 49
23	16 3	23	12 25
24	18 1	24	13 59
25	20 0	25	15 31
26	22 0	26	17 2
27	24 0	27	18 32
28	26 0	28	19 59
29	28 0	29	21 26
30	0 VS 0	30	22 52

The Table of the Nonagesime Degree, for the Latitude of 43 Degrees, continued.

Cusp 10. Aquarius °	Nonage- sime. °	Cusp 10. Pisces. °	Nonage- sime. °
0	22 52	0	26 21
1	24 16	1	27 15
2	25 38	2	28 08
3	26 59	3	29 01
4	28 18	4	29 53
5	29 35	5	30 45
6	30 51	6	1 36
7	32 05	7	2 27
8	33 19	8	3 17
9	34 32	9	4 07
10	35 44	10	4 57
11	36 55	11	5 46
12	38 05	12	6 35
13	39 13	13	7 23
14	40 20	14	8 11
15	41 26	15	8 59
16	42 31	16	9 46
17	43 36	17	10 32
18	44 40	18	11 19
19	45 43	19	12 06
20	46 45	20	12 52
21	47 46	21	13 38
22	48 46	22	14 24
23	49 45	23	15 10
24	50 43	24	15 55
25	51 41	25	16 40
26	52 38	26	17 25
27	53 35	27	18 09
28	54 31	28	18 54
29	55 26	29	19 39
30	56 21	30	20 24

Table of the Nonagesime Degree for the Latitude of 45 Degrees.

Cusp 10. Aries.	Nonagesime.	Cusp 10. Taurus.	Nonagesime.
0	21 45	0	13 9
1	22 28	1	13 52
2	23 12	2	14 35
3	23 55	3	15 18
4	24 29	4	16 2
5	25 22	5	16 45
6	26 5	6	17 19
7	26 47	7	18 13
8	27 30	8	18 17
9	28 12	9	19 41
10	28 55	10	20 25
11	29 37	11	21 9
12	0 19	12	21 53
13	1 2	13	22 37
14	1 44	14	23 22
15	2 27	15	24 6
16	3 9	16	24 51
17	3 52	17	25 37
18	4 34	18	26 22
19	5 17	19	27 7
20	5 59	20	27 52
21	6 42	21	28 38
22	7 25	22	29 24
23	8 7	23	0 10
24	8 50	24	0 56
25	9 33	25	1 42
26	10 17	26	2 29
27	11 0	27	3 16
28	11 43	28	4 2
29	12 26	29	4 49
30	13 9	30	5 36

The Table of the Nonagesime Degree, for the Latitude of 45 Degrees, continu'd.

Cusp 10. Gemini.	Nonagesime.	Cusp 10. Cancer.	Nonagesime.
0	5 11 36	0	0 9 0
1	6 23	1	0 50
2	7 10	2	1 40
3	7 58	3	2 29
4	8 46	4	3 19
5	9 33	5	4 9
6	10 21	6	4 58
7	11 9	7	5 48
8	11 57	8	6 37
9	12 45	9	7 27
10	13 53	10	8 16
11	14 22	11	9 5
12	15 11	12	9 55
13	16 0	13	10 44
14	16 49	14	11 33
15	17 38	15	12 22
16	18 27	16	13 11
17	19 16	17	14 0
18	20 5	18	14 49
19	20 55	19	15 38
20	21 44	20	16 27
21	22 33	21	17 19
22	23 23	22	18 3
23	24 12	23	18 51
24	25 2	24	19 39
25	25 51	25	20 27
26	26 41	26	21 14
27	27 31	27	22 2
28	28 20	28	22 50
29	29 10	29	23 37
30	0 0	30	24 24

The Table of the Nonagesime Degrees, for the Latitude of 45 Degrees, continued.

Cusp 10. Leo	Nonage- sime.	Cusp 10. Virgo	Nonage- sime.
0	24 24	0	16 31
1	25 11	1	17 34
2	25 58	2	18 17
3	26 44	3	19 0
4	27 31	4	19 43
5	28 18	5	20 27
6	29 4	6	21 10
7	29 50	7	21 53
8	0 36	8	22 35
9	1 22	9	23 18
10	2 8	10	24 1
11	2 53	11	24 43
12	3 38	12	25 26
13	4 23	13	26 8
14	5 9	14	26 51
15	5 54	15	27 33
16	6 38	16	28 16
17	7 23	17	28 58
18	8 7	18	29 41
19	8 51	19	0 23
20	9 35	20	1 5
21	10 19	21	1 48
22	11 3	22	2 30
23	11 47	23	3 13
24	12 31	24	3 55
25	13 15	25	4 48
26	13 58	26	5 21
27	14 42	27	6 5
28	15 25	28	6 48
29	16 8	29	7 32
30	16 51	30	8 15

The Table of the Nonagesime Degree, for the Latitude of
45 Degrees, continued.

Cusp 10. Libra. °	Nonage- sime. °	Cusp 10. Scorpio. °	Nonage- sime. °
0	8 15	0	1 56
1	8 58	1	2 50
2	9 42	2	3 44
3	10 26	3	4 39
4	11 10	4	5 35
5	11 55	5	6 31
6	12 39	6	7 28
7	13 23	7	8 26
8	14 8	8	9 24
9	14 53	9	10 23
10	15 38	10	11 24
11	16 24	11	12 26
12	17 10	12	13 28
13	17 56	13	14 31
14	18 42	14	15 35
15	19 28	15	16 40
16	20 15	16	17 46
17	21 2	17	18 53
18	21 49	18	20 0
19	22 37	19	21 8
20	23 26	20	22 18
21	24 15	21	23 30
22	25 5	22	24 43
23	25 55	23	25 58
24	26 45	24	27 14
25	27 36	25	28 31
26	28 27	26	29 50
27	29 29	27	1 10
28	0 11	28	2 31
29	1 3	29	3 53
30	1 56	30	5 17

A Table of the Nonagesime Degree, for the Latitude of 45 Degrees, continued.

Cusp 10. Sagittary	Nonage- sime.	Cusp 10. Capricorn	Nonage- sime.
0	5 17	0	0 0
1	6 43	1	2 7
2	8 10	2	4 14
3	9 39	3	6 20
4	11 10	4	8 25
5	12 43	5	10 30
6	14 17	6	12 34
7	15 53	7	14 37
8	17 31	8	16 39
9	19 10	9	18 39
10	20 51	10	20 38
11	22 34	11	22 36
12	24 19	12	24 32
13	26 6	13	26 27
14	27 55	14	28 21
15	29 46	15	0 14
16	1 39	16	2 5
17	3 33	17	3 54
18	5 28	18	5 41
19	7 24	19	7 26
20	9 22	20	9 9
21	11 21	21	10 50
22	13 21	22	12 29
23	15 23	23	14 7
24	17 26	24	15 43
25	19 30	25	17 17
26	21 35	26	18 50
27	23 40	27	20 21
28	25 46	28	21 50
29	27 53	29	23 17
30	0 0	30	24 43

The Table of the Nonagesime Degree, for the Latitude of
45 Degrees, continu'd.

Cusp 10. <i>Aquarius</i> °	Nonage- sime. °		Cusp 10. <i>Pisces</i> °	Nonage- sime. °	
0	24 ^m 43		0	28 ^m 4	
1	26 07		1	28 57	
2	27 29		2	29 49	
3	28 50		3	0 41	
4	0 10		4	1 53	
5	1 29		5	2 24	
6	2 46		6	3 15	
7	4 01		7	4 05	
8	5 17		8	4 55	
9	6 50		9	5 45	
10	7 42		10	6 34	
11	8 52		11	7 23	
12	10 0		12	8 11	
13	11 7		13	8 58	
14	12 14		14	9 45	
15	13 20		15	10 31	
16	14 25		16	11 18	
17	15 29		17	12 04	
18	16 32		18	12 50	
19	17 44		19	13 36	
20	18 36		20	14 22	
21	19 37		21	15 07	
22	20 36		22	15 52	
23	21 34		23	16 37	
24	22 32		24	17 21	
25	23 29		25	18 05	
26	24 25		26	18 50	
27	25 21		27	19 34	
28	26 16		28	20 18	
29	27 10		29	21 02	
30	28 04		30	21 45	

A Table of the Nonagesime Degree, for the Latitude of
46 Degrees.

Culp 10. Aries.	Nonage- sime.	Culp 10. Taurus.	Nonage- sime.
0	22 23	0	13 37
1	23 9	1	14 19
2	23 51	2	15 2
3	24 35	3	15 46
4	25 18	4	16 28
5	26 0	5	17 11
6	26 42	6	17 55
7	27 24	7	18 38
8	28 7	8	19 22
9	28 50	9	20 5
10	29 32	10	20 49
11	0 16	11	21 33
12	1 57	12	22 17
13	2 38	13	23 1
14	3 20	14	23 45
15	4 2	15	24 29
16	5 45	16	25 13
17	6 26	17	25 58
18	7 8	18	26 43
19	8 51	19	27 28
20	9 33	20	28 13
21	10 15	21	28 58
22	11 58	22	29 44
23	12 40	23	30 29
24	13 22	24	1 15
25	14 4	25	2 0
26	15 47	26	3 46
27	16 29	27	4 32
28	17 32	28	5 19
29	18 55	29	6 5
30	19 37	30	7 51

The

The Table of the Nonagesime Degree, for the Latitude of
46 Degrees, continued.

Mas

Cusp 10. Gemini.	Nonage- sime.	Cusp 10. Cancer	Nonage- sime.
0	5 11 51	0	0 20 0
1	6 38	1	0 50
2	7 25	2	1 39
3	8 12	3	2 28
4	8 59	4	3 17
5	9 46	5	4 6
6	10 33	6	4 55
7	11 21	7	5 45
8	12 9	8	6 34
9	12 56	9	7 22
10	13 44	10	8 11
11	14 32	11	9 0
12	15 21	12	9 49
13	16 9	13	10 37
14	16 57	14	11 25
15	17 46	15	12 14
16	18 34	16	13 3
17	19 22	17	13 51
18	20 11	18	14 39
19	21 0	19	15 28
20	21 49	20	16 16
21	22 37	21	17 4
22	23 26	22	17 51
23	24 15	23	18 39
24	25 5	24	19 26
25	25 54	25	20 13
26	26 42	26	21 1
27	27 32	27	21 48
28	28 21	28	22 35
29	29 10	29	23 22
30	0 0 0	30	24 9

The Table of the Nonagesime Degree for the Latitude of
46 Degrees, continued.

usp 16. co.	Nonage- sime.	Cusp 10. Virgo.	Nonage- sime.
0	24 59	0	16 23
1	24 55	1	17 5
2	25 41	2	17 48
3	26 27	3	18 30
4	27 13	4	19 13
5	28 0	5	19 55
6	28 45	6	20 38
7	29 30	7	21 20
8	0 16	8	22 2
9	1 1	9	22 45
10	1 46	10	23 27
11	2 32	11	24 9
12	3 17	12	24 51
13	4 1	13	25 34
14	4 46	14	26 15
15	5 31	15	26 58
16	6 15	16	27 40
17	6 59	17	28 28
18	7 43	18	29 4
19	8 27	19	29 46
20	9 11	20	0 28
21	9 55	21	1 10
22	10 38	22	1 53
23	11 21	23	2 35
24	12 5	24	3 18
25	12 49	25	4 0
26	13 32	26	4 42
27	14 14	27	5 25
28	14 58	28	6 8
29	15 51	29	6 50
30	16 23	30	7 35

The Table of the Nonagesime Degree, for the Latitude of
46 Degrees, continued.

Dec

Cusp 10. Libra. °	Nonage- sime. °		Cusp 10. Scorpio °	Nonage- sime. °	
0	7	35	0	1	3
1	8	17	1	1	56
2	9	1	2	2	50
3	9	44	3	3	45
4	10	28	4	4	40
5	11	12	5	5	36
6	11	56	6	6	32
7	12	40	7	7	31
8	13	24	8	8	30
9	14	9	9	9	28
10	14	53	10	10	29
11	15	38	11	11	30
12	16	25	12	12	31
13	17	10	13	13	34
14	17	56	14	14	37
15	18	42	15	15	41
16	19	29	16	16	48
17	21	15	17	17	55
18	21	2	18	19	2
19	22	50	19	20	10
20	23	38	20	21	21
21	23	26	21	22	32
22	24	15	22	23	44
23	25	4	23	24	59
24	25	54	24	26	14
25	26	35	25	27	30
26	27	36	26	28	48
27	28	27	27	0	8
28	29	18	28	1	29
29	0	10	29	2	51
30	1	3	30	4	15

as

The Table of the Nonagesime Degree, for the Latitude of
46 Degrees, continued.

Cusp 10. Sagittary °	Nonage- sime. °		Cusp 10. Capricorn °	Nonage- sime. °	
0	4	m 15	0	0	VS 0
1	5	43	1	2	12
2	7	13	2	4	21
3	8	43	3	6	29
4	10	13	4	8	39
5	11	43	5	10	46
6	13	19	6	12	52
7	14	57	7	15	0
8	16	38	8	17	5
9	18	17	9	19	9
10	20	0	10	21	11
11	21	45	11	23	11
12	23	32	12	25	11
13	25	19	13	27	9
14	27	9	14	29	3
15	29	2	15	0	VS 58
16	0	2 56	16	2	51
17	2	51	17	4	41
18	4	49	18	6	28
19	6	49	19	8	15
20	8	49	20	10	0
21	10	50	21	11	42
22	12	54	22	13	22
23	15	0	23	15	03
24	17	8	24	16	40
25	19	14	25	18	14
26	21	23	26	19	47
27	23	31	27	21	17
28	25	39	28	22	47
29	27	48	29	24	17
30	0	VS 0	30	25	45

The Table of the Nonagesime Degree, for the Latitude of
46 Degrees, continu'd.

Cusp 10. <i>Aquarius</i>	Nonage- sime.	Cusp 10. <i>Pisces</i>	Nonage- sime.
0	25 45	0	28 57
1	27 09	1	29 50
2	28 31	2	0 42
3	29 52	3	1 33
4	1 11	4	2 24
5	2 30	5	3 15
6	3 46	6	4 06
7	5 01	7	4 56
8	6 15	8	5 44
9	7 28	9	6 33
10	8 39	10	7 21
11	9 49	11	8 09
12	10 58	12	8 57
13	12 04	13	9 45
14	13 12	14	10 31
15	14 18	15	11 17
16	15 22	16	12 04
17	16 26	17	12 43
18	17 28	18	13 35
19	18 30	19	14 21
20	19 31	20	15 06
21	20 31	21	15 51
22	21 30	22	16 36
23	22 29	23	17 20
24	23 27	24	18 04
25	24 24	25	18 48
26	25 20	26	19 32
27	26 15	27	20 16
28	27 10	28	20 59
29	28 04	29	21 42
30	28 57	30	22 25

The Table of the Nonagesime Degree, for the Latitude of
48 Degrees.

Cusp 10. Aries.	Nona- gesime.	Cusp 10. Taurus.	Nona- gesime.
0	23 53	0	14 38
1	24 37	1	15 20
2	25 19	2	16 02
3	26 00	3	16 44
4	26 42	4	17 26
5	27 24	5	18 09
6	28 05	6	18 51
7	28 46	7	19 33
8	29 27	8	20 16
9	0 09	9	20 58
10	0 50	10	21 40
11	1 32	11	22 23
12	2 13	12	23 05
13	2 54	13	23 48
14	3 35	14	24 31
15	4 16	15	25 14
16	4 57	16	25 58
17	5 38	17	26 42
18	6 19	18	27 26
19	7 01	19	28 10
20	7 42	20	28 54
21	8 23	21	29 39
22	9 05	22	0 23
23	9 46	23	1 07
24	10 28	24	1 52
25	11 09	25	2 37
26	11 51	26	3 22
27	12 32	27	4 07
28	13 14	28	4 53
29	13 56	29	5 38
30	14 38	30	6 23

The Table of the Nonagesime Degree, for the Latitude of 48 Degrees, continued.

MC

Cusp 10. Gemini.	Nonagesime.	Cusp 10. Cancer.	Nonagesime.
0	6 11 23	0	0 5 0
1	7 08	1	0 49
2	7 54	2	1 37
3	8 40	3	2 25
4	9 26	4	3 13
5	10 13	5	4 01
6	10 59	6	4 49
7	11 46	7	5 37
8	12 32	8	6 25
9	13 19	9	7 13
10	14 05	10	8 01
11	14 52	11	8 48
12	15 39	12	9 36
13	16 26	13	10 24
14	17 13	14	11 12
15	18 01	15	11 59
16	18 48	16	12 47
17	19 36	17	13 34
18	20 24	18	14 21
19	21 12	19	15 08
20	22 0	20	15 55
21	22 47	21	16 41
22	23 35	22	17 29
23	24 33	23	18 14
24	25 11	24	19 01
25	25 59	25	19 47
26	26 47	26	20 34
27	27 35	27	21 20
28	28 23	28	22 06
29	29 11	29	22 52
30	0 5 0	30	23 37

The Table of the Nonagesime Degree for the Latitude of
48 Degrees; continued.

Cusp 10 Leo.	Nonage- sime.	Cusp 10 Virgo.	Nonage- sime.
0	23 37	0	15 22
1	24 22	1	16 04
2	25 07	2	16 46
3	25 53	3	17 28
4	26 38	4	18 09
5	27 23	5	18 51
6	28 08	6	19 32
7	28 53	7	20 14
8	29 37	8	20 55
9	0 21	9	21 37
10	1 06	10	22 18
11	1 59	11	22 59
12	2 34	12	23 41
13	3 18	13	24 22
14	4 02	14	25 03
15	4 46	15	25 44
16	5 29	16	26 25
17	6 12	17	27 06
18	6 55	18	27 47
19	7 37	19	28 28
20	8 20	20	29 10
21	9 02	21	29 51
22	9 44	22	30 33
23	10 27	23	1 14
24	11 09	24	1 55
25	11 51	25	2 36
26	12 34	26	3 18
27	13 16	27	4 00
28	13 58	28	4 41
29	14 40	29	5 23
30	15 22	30	6 05

The Table of the Nonagesimo Degree, for the Latitude of 48 Degrees, continu'd.

Cusp 10. Libra.	Nonage- simo	Cusp 10. Scorpio.	Nonage- simo
0	6 17 5	0	29 17 4
1	6 47	1	29 56
2	7 30	2	29 42
3	8 13	3	29 43
4	8 55	4	29 37
5	9 38	5	29 32
6	10 21	6	29 28
7	11 04	7	29 24
8	11 47	8	29 21
9	12 31	9	29 18
10	13 15	10	29 16
11	14 00	11	29 16
12	14 44	12	29 17
13	15 28	13	29 20
14	16 13	14	29 23
15	16 58	15	29 27
16	17 44	16	29 31
17	18 49	17	29 36
18	19 15	18	29 43
19	20 02	19	29 51
20	20 49	20	29 51
21	21 36	21	29 53
22	22 24	22	29 56
23	23 12	23	29 40
24	24 01	24	29 55
25	24 50	25	29 51
26	25 40	26	29 28
27	26 30	27	29 47
28	27 21	28	29 8
29	28 12	29	29 31
30	29 04	30	29 56

The Table of the Nonagesime Degree, for the Latitude of
48 Degrees, continu'd.

Cusp 10. Sagittary °	Nonage- sime. °	Cusp 10. Capricorn °	Nonage- sime. °
0	1 m 56	0	0 VS 0
1	3 23	1	2 19
2	4 52	2	4 36
3	6 23	3	6 54
4	7 56	4	9 12
5	9 31	5	11 29
6	11 08	6	13 45
7	12 47	7	15 59
8	14 28	8	18 11
9	16 11	9	20 21
10	17 56	10	22 29
11	19 43	11	24 36
12	21 33	12	26 41
13	23 26	13	28 44
14	25 21	14	0 44
15	27 18	15	2 42
16	29 16	16	4 39
17	1 16	17	6 34
18	3 19	18	8 27
19	4 24	19	10 17
20	7 31	20	12 04
21	9 39	21	13 49
22	11 49	22	15 32
23	14 01	23	17 13
24	16 15	24	18 52
25	18 31	25	20 29
26	20 48	26	21 04
27	23 06	27	23 37
28	25 24	28	25 08
29	27 41	29	26 37
30	0 VS 0	30	28 04

The Table of the Nonagesime Degree, for the Latitude of 48 Degrees, continued.

Cusp 10. Aquarius	Nonage- sime.	Cusp 10. Pisces.	Nonage- sime.
0	28 4	0	0 56
1	29 29	1	1 48
2	0 52	2	2 39
3	2 13	3	3 30
4	3 32	4	4 20
5	4 49	5	5 10
6	6 05	6	5 59
7	7 20	7	6 48
8	8 34	8	7 36
9	9 47	9	8 24
10	10 59	10	9 11
11	12 09	11	9 58
12	13 17	12	10 45
13	14 24	13	11 31
14	15 29	14	12 16
15	16 33	15	13 02
16	17 37	16	13 47
17	18 40	17	14 32
18	19 43	18	15 16
19	20 44	19	16 0
20	21 44	20	16 45
21	22 42	21	17 29
22	23 39	22	18 13
23	24 36	23	18 56
24	25 32	24	19 39
25	26 28	25	20 22
26	27 23	26	21 05
27	28 17	27	21 47
28	29 11	28	22 30
29	0 04	29	23 13
30	0 56	30	23 55

Table of the Nonagesime Degree for the Latitude of
51 Degrees.

Cusp 10. Aries.	Nonage- sime.	Cusp 10. Taurus.	Nonage- sime.
0	26 14	0	18 12
1	26 55	1	16 53
2	27 35	2	17 33
3	28 15	3	18 14
4	28 56	4	18 54
5	29 36	5	19 35
6	0 16	6	20 16
7	0 56	7	20 57
8	1 36	8	21 38
9	2 16	9	22 19
10	2 56	10	23 0
11	3 36	11	23 41
12	4 15	12	24 22
13	4 55	13	25 4
14	5 35	14	25 46
15	6 14	15	26 28
16	6 54	16	27 12
17	7 34	17	27 52
18	8 13	18	28 34
19	8 53	19	29 17
20	9 33	20	0 0
21	10 13	21	0 42
22	10 53	22	1 25
23	11 33	23	2 08
24	12 12	24	2 51
25	12 52	25	3 34
26	13 32	26	4 18
27	14 12	27	5 02
28	14 52	28	5 45
29	15 32	29	6 29
30	16 12	30	7 13

The Table of the Nongessime Degrees, for the Latitude of
54 Degrees, continu'd.

Cusp 10. Gemini.	Nona- gesime.		Cusp 10. Cancer.	Nona- gesime.	
0	7	13	0	0	0
1	7	57	1	0	47
2	8	42	2	1	33
3	9	26	3	2	19
4	10	11	4	3	6
5	10	55	5	3	52
6	11	40	6	4	38
7	12	25	7	5	25
8	13	09	8	6	11
9	13	54	9	6	57
10	14	39	10	7	44
11	15	25	11	8	30
12	16	10	12	9	16
13	16	55	13	10	2
14	17	41	14	10	48
15	18	27	15	11	33
16	19	12	16	12	12
17	19	58	17	13	4
18	20	44	18	13	50
19	21	30	19	14	35
20	22	16	20	15	21
21	23	03	21	16	6
22	23	49	22	16	51
23	24	35	23	17	36
24	25	22	24	18	20
25	26	8	25	19	5
26	26	54	26	19	50
27	27	41	27	20	34
28	28	27	28	21	28
29	29	23	29	22	3
30	0	0	30	22	47

The Table of the Nonagesime Degree, for the Latitude of
51 Degrees, continued.

Cusp 10. Leo.	Nonage- sime.	Cusp 10. Virgo.	Nonage- sime.
0	22 47	0	13 48
1	23 31	1	14 28
2	24 15	2	15 8
3	24 58	3	15 48
4	25 42	4	16 28
5	26 26	5	17 8
6	27 9	6	17 48
7	27 52	7	18 27
8	28 35	8	19 7
9	29 18	9	19 47
10	0 0	10	20 26
11	0 43	11	21 6
12	1 26	12	21 47
13	2 8	13	22 26
14	2 50	14	23 6
15	3 32	15	23 46
16	4 14	16	24 25
17	4 56	17	25 5
18	5 38	18	25 45
19	6 19	19	26 25
20	7 0	20	27 4
21	7 41	21	27 44
22	8 22	22	28 24
23	9 3	23	29 4
24	9 44	24	29 44
25	10 25	25	0 24
26	11 6	26	1 4
27	11 46	27	1 45
28	12 27	28	2 25
29	13 7	29	3 5
30	13 48	30	3 46

The Table of the Nonagesime Degree, for the Latitude of
31 Degrees, continued.

Cusp 10. Libra.	Nonagesime.	Cusp 10. Scorpio.	Nonagesime.
0	46	0	25 51
1	26	1	26 41
2	7	2	27 32
3	48	3	28 24
4	30	4	29 16
5	11	5	0 9
6	52	6	1 3
7	34	7	1 58
8	16	8	2 53
9	18	9	3 49
10	41	10	4 46
11	23	11	5 43
12	6	12	6 42
13	49	13	7 42
14	32	14	8 43
15	15	15	9 45
16	48	16	10 48
17	42	17	11 52
18	26	18	12 58
19	11	19	14 4
20	57	20	15 12
21	41	21	16 21
22	28	22	17 32
23	15	23	18 44
24	1	24	19 58
25	48	25	21 14
26	36	26	22 31
27	24	27	23 50
28	12	28	25 11
29	1	29	26 33
30	51	30	27 57

A Table of the Nonagesime Degree, for the Latitude of 51 Degrees, continued.

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Cusp 10. Sagittary	Nonagesime	Cusp 10. Capricorn	Nonagesime
0	27 57	0	0 VS 0
1	29 23	1	2 36
2	31 52	2	5 21
3	2 24	3	7 45
4	3 58	4	10 17
5	5 33	5	12 48
6	7 15	6	15 16
7	8 57	7	17 43
8	10 41	8	20 9
9	12 27	9	22 32
10	14 13	10	24 52
11	16 7	11	27 19
12	18 2	12	29 26
13	20 0	13	31 40
14	22 10	14	33 50
15	24 3	15	35 57
16	26 10	16	38 0
17	28 20	17	40 10
18	30 34	18	41 58
19	32 50	19	43 53
20	35 8	20	45 45
21	37 28	21	47 33
22	39 51	22	49 19
23	42 16	23	51 3
24	44 43	24	52 45
25	47 12	25	54 25
26	49 43	26	56 02
27	52 15	27	57 36
28	54 49	28	59 8
29	57 24	29	60 X 57
30	60 VS 0	30	62 03

The Table of the Nonagesime Degree, for the Latitude of 51 Degrees, continued.

Cusp 10. Aquarius	Nonagesime.	Cusp 10. Pisces	Nonagesime.
0	2 3	0	4 9
1	3 27	1	4 59
2	4 49	2	5 48
3	6 10	3	6 36
4	7 29	4	7 24
5	8 49	5	8 12
6	10 2	6	8 59
7	11 16	7	9 45
8	12 28	8	10 32
9	13 39	9	11 18
10	14 48	10	12 3
11	15 56	11	12 49
12	17 2	12	13 34
13	18 8	13	14 18
14	19 12	14	15 2
15	20 13	15	15 45
16	21 17	16	16 28
17	22 18	17	17 11
18	23 18	18	17 54
19	24 17	19	18 57
20	25 14	20	19 19
21	26 13	21	20 2
22	27 7	22	20 44
23	28 2	23	21 26
24	28 57	24	22 8
25	29 51	25	22 49
26	0 44	26	23 30
27	1 36	27	24 12
28	2 28	28	24 53
29	3 19	29	25 34
30	4 2	30	26 14

Table of the Nonagesime Degree, for the Latitude of
52 Degrees 20 Minutes.

Cusp 10. Aries.	Nonage- sime.	Cusp 10. Taurus.	Nonage- sime.
0	27 18	0	17 12
1	27 40	1	17 41
2	28 10	2	18 22
3	28 42	3	19 2
4	29 2	4	19 43
5	29 43	5	20 23
6	0 23	6	21 3
7	1 7	7	21 42
8	2 41	8	22 23
9	3 17	9	22 41
10	3 56	10	23 21
11	4 37	11	23 41
12	5 18	12	24 32
13	5 53	13	25 42
14	6 32	14	26 23
15	7 11	15	27 4
16	7 50	16	27 44
17	8 30	17	28 26
18	9 10	18	29 7
19	9 51	19	29 49
20	10 27	20	0 31
21	11 10	21	1 13
22	11 48	22	1 55
23	12 21	23	2 37
24	13 17	24	3 20
25	13 46	25	4 3
26	14 27	26	4 45
27	15 4	27	5 28
28	15 45	28	6 11
29	16 25	29	6 54
30	17 12	30	7 36

The Table of the Nonagesime Degree, for the Latitude of
52 Degrees 20 Minutes, continued.

Cusp 10. Gemini. °	Nonage- sime. °	Cusp 10. Cancer. °	Nonage- sime. °
0	7 36	0	0 36
1	8 19	1	6 46
2	9 03	2	1 31
3	9 46	3	2 17
4	10 30	4	3 03
5	11 14	5	3 48
6	11 58	6	4 34
7	12 42	7	5 19
8	13 26	8	6 04
9	14 10	9	6 50
10	14 55	10	7 35
11	15 39	11	8 20
12	16 24	12	9 06
13	17 09	13	9 51
14	17 54	14	10 36
15	18 39	15	11 21
16	19 24	16	12 06
17	20 09	17	12 51
18	20 54	18	13 36
19	21 39	19	14 21
20	22 24	20	15 05
21	23 09	21	15 20
22	23 55	22	16 34
23	24 40	23	17 18
24	25 26	24	18 02
25	26 12	25	18 46
26	26 57	26	19 30
27	27 43	27	20 14
28	28 29	28	20 57
29	29 14	29	21 41
30	0 00	30	22 24

The Table of the Nonagesime Degree for the Latitude of
30 Degrees 20 Minutes, computed.

MR.

Cusp 10. Leo.	Nonage- sime.	Cusp 10. Virgo.	Nonage- sime.
00	22 54	00	11 39
10	23 07	10	13 43
20	23 50	20	14 22
30	24 33	30	15 01
40	25 16	40	15 41
50	25 58	50	16 20
60	26 41	60	16 59
70	27 23	70	17 39
80	28 06	80	18 18
90	28 48	90	18 57
100	29 30	100	19 36
110	00 12	110	20 15
120	00 54	120	20 54
130	01 36	130	21 33
140	02 17	140	22 12
150	02 58	150	22 51
160	03 39	160	23 30
170	04 20	170	24 09
180	05 01	180	24 48
190	05 42	190	25 27
200	06 22	200	26 06
210	07 03	210	26 45
220	07 44	220	27 24
230	08 24	230	28 04
240	09 04	240	28 43
250	09 44	250	29 23
260	10 24	260	00 02
270	11 04	270	00 42
280	11 44	280	01 21
290	12 24	290	02 01
300	13 03	300	02 42

The Table of the Nonagesima Degree, for the Latitude of
52 Degrees, 20 Minutes, continued.

m ₁		m ₂	
Cusp 10. Libra.	Nonage- sime.	Cusp 10. Scorpio.	Nonage- sime.
0	2 42	0	24 23
1	3 22	1	25 12
2	4 2	2	26 2
3	4 42	3	26 54
4	5 22	4	27 41
5	6 2	5	28 36
6	6 43	6	29 30
7	7 23	7	0 24
8	8 5	8	1 20
9	8 46	9	2 14
10	9 27	10	3 9
11	10 10	11	4 7
12	10 53	12	5 6
13	11 34	13	6 5
14	12 16	14	7 4
15	13 0	15	8 4
16	13 43	16	9 6
17	14 26	17	10 8
18	15 8	18	11 12
19	15 54	19	12 18
20	16 36	20	13 25
21	17 21	21	14 31
22	18 7	22	15 41
23	18 54	23	16 42
24	19 39	24	18 5
25	20 26	25	19 18
26	21 13	26	20 56
27	22 0	27	21 53
28	22 47	28	23 14
29	23 38	29	24 37
30	24 23	30	26 1

The Table of the Nonagesime Degree, for the Latitude of
32 Degrees 20 Minutes, continued.

Cusp 10. Sagittary	Nonage- sime.	Cusp 10. Capricorn	Nonage- sime.
0	26 1	0	0 VS 0
1	27 27	1	2 44
2	28 56	2	5 27
3	0 26	3	8 8
4	0 0	4	10 49
5	3 37	5	13 29
6	5 16	6	16 7
7	6 58	7	18 42
8	8 45	8	21 15
9	10 31	9	23 45
10	12 21	10	26 12
11	14 14	11	28 35
12	16 11	12	0 56
13	18 12	13	2 15
14	20 16	14	5 28
15	22 24	15	7 38
16	24 35	16	9 45
17	26 48	17	11 49
18	29 6	18	13 50
19	1 26	19	15 45
20	3 50	20	17 41
21	6 16	21	19 27
22	8 46	22	21 19
23	11 18	23	23 3
24	13 54	24	24 45
25	16 32	25	26 24
26	19 12	26	28 0
27	21 53	27	29 34
28	24 34	28	1 5
29	27 17	29	2 34
30	0 VS 0	30	3 59

The Table of the Nonagesime Degree, for the Latitude of
52 Degrees 20 Minutes, continu'd.

Cusp 10. Aquarius	Nonage- sime.	Cusp 10. Pisces.	Nonage- sime.
0	3 59	0	5 37
1	5 25	1	6 26
2	6 49	2	7 14
3	8 8	3	8 2
4	9 26	4	8 50
5	10 42	5	9 37
6	11 57	6	10 23
7	13 10	7	11 8
8	14 21	8	11 54
9	15 31	9	12 39
10	16 39	10	13 27
11	17 46	11	14 8
12	18 52	12	14 33
13	19 56	13	15 34
14	20 57	14	16 18
15	22 0	15	17 1
16	23 0	16	17 44
17	23 59	17	18 26
18	24 58	18	19 8
19	25 57	19	19 50
20	26 53	20	20 32
21	27 49	21	21 13
22	28 45	22	21 54
23	29 39	23	22 31
24	0 32	24	23 16
25	1 25	25	23 57
26	2 16	26	24 37
27	3 6	27	25 18
28	3 56	28	25 58
29	4 47	29	26 38
30	5 37	30	27 18

The Table of the Nonagesime Degree, for the Latitude of
53 Degrees 22 Minutes.

Cusp 10. Aries.	Nonage- sime.	Cusp 10. Taurus.	Nonage- sime.
0	28 11	0	17 51
1	28 51	1	18 30
2	29 30	2	19 9
3	0 9	3	19 48
4	0 48	4	20 25
5	1 28	5	21 4
6	2 8	6	21 43
7	2 48	7	22 22
8	3 28	8	23 1
9	4 8	9	23 40
10	4 48	10	24 20
11	5 26	11	25 0
12	6 6	12	25 40
13	6 46	13	26 29
14	7 25	14	27 0
15	8 5	15	27 38
16	8 45	16	28 18
17	9 25	17	29 0
18	10 4	18	29 40
19	10 43	19	0 20
20	11 21	20	1 0
21	11 59	21	1 40
22	12 41	22	2 21
23	13 18	23	3 2
24	13 56	24	3 43
25	14 35	25	4 23
26	15 14	26	5 5
27	15 53	27	5 46
28	16 33	28	6 29
29	17 12	29	7 12
30	17 31	30	7 54

The Table of the Nonagesime Degree, for the Latitude of
33 Degrees 22 Minutes, continu'd.

Cusp 10. Gemini.	Nonage- sime.	Cusp 10. Cancer.	Nonage- sime.
0	7 11 54	0	0 9 0
1	8 37	1	0 46
2	9 21	2	1 31
3	10 4	3	2 16
4	10 47	4	3 0
5	11 30	5	3 45
6	12 13	6	4 30
7	12 56	7	5 14
8	13 39	8	5 59
9	14 22	9	6 44
10	15 6	10	7 28
11	15 49	11	8 12
12	16 33	12	8 57
13	17 17	13	9 42
14	18 1	14	10 26
15	18 46	15	11 11
16	19 30	16	11 56
17	20 15	17	12 40
18	20 59	18	13 24
19	21 44	19	14 9
20	22 29	20	14 53
21	23 14	21	15 37
22	23 58	22	16 21
23	24 43	23	17 5
24	25 29	24	17 49
25	26 14	25	18 34
26	26 58	26	19 18
27	27 44	27	20 1
28	28 29	28	20 43
29	29 14	29	21 26
30	0 0 0	30	22 6

The Table of the Nonagesime Degree for the Latitude of
53 Degrees 22 Minutes, continued.

mas

Cusp 10. Leo.	Nonage- sime.	Cusp 10. Virgo.	Nonage- sime.
0	22 56	0	12 09
1	22 48	1	12 48
2	23 31	2	13 27
3	24 13	3	14 06
4	24 55	4	14 44
5	25 37	5	15 22
6	26 19	6	16 01
7	26 58	7	16 41
8	27 40	8	17 20
9	28 22	9	18 09
10	29 03	10	18 48
11	29 45	11	19 27
12	0 26	12	20 06
13	1 07	13	20 45
14	1 48	14	21 24
15	2 29	15	22 03
16	3 09	16	22 43
17	3 49	17	23 22
18	4 29	18	24 01
19	5 09	19	24 40
20	5 48	20	25 19
21	6 27	21	25 58
22	7 06	22	26 37
23	7 45	23	27 16
24	8 24	24	27 55
25	9 02	25	28 34
26	9 39	26	29 13
27	10 18	27	29 52
28	10 57	28	30 31
29	11 34	29	1 10
30	12 09	30	1 49

mas

The Table of the Nonagesime Degree, for the Latitude of 53 Degrees 22 Minutes, continu'd.

Cusp 10. Libra.	Nonagesime.	Cusp 10. Scorpio.	Nonagesime.
0	1 49	0	23 6
1	2 29	1	23 54
2	3 08	2	24 44
3	3 48	3	25 34
4	5 28	4	26 24
5	5 08	5	27 15
6	5 48	6	28 06
7	6 28	7	28 58
8	7 08	8	29 51
9	7 49	9	0 44
10	8 30	10	1 37
11	9 10	11	2 33
12	9 51	12	3 29
13	10 31	13	4 26
14	11 12	14	5 26
15	11 54	15	6 26
16	12 36	16	7 29
17	13 16	17	8 30
18	13 57	18	9 33
19	14 42	19	10 37
20	15 25	20	11 44
21	16 09	21	12 52
22	16 45	22	14 02
23	17 39	23	15 12
24	18 24	24	16 24
25	19 10	25	17 37
26	19 57	26	18 54
27	20 44	27	20 12
28	21 30	28	21 33
29	22 18	29	22 54
30	23 06	30	24 17

The Table of the Nonagesime Degree, for the Latitude of 53 Degrees 22 Minutes, continu'd.

Cusp 10. Sagittary °	Nonage- sime. °	Cusp 10. Capricorn °	Nonage- sime. °
0	24 17	0	0 VS 0
1	25 34	1	2 52
2	27 15	2	5 40
3	28 46	3	8 27
4	0 m 21	4	11 16
5	2 0	5	14 0
6	3 39	6	16 43
7	5 22	7	19 26
8	7 10	8	22 02
9	8 58	9	24 37
10	10 51	10	27 08
11	12 47	11	29 35
12	14 47	12	2 01
13	16 51	13	4 22
14	18 06	14	6 39
15	21 07	15	8 53
16	23 21	16	11 04
17	25 36	17	13 09
18	27 57	18	15 12
19	0 22	19	17 12
20	2 50	20	19 08
21	5 21	21	21 03
22	7 53	22	22 51
23	10 31	23	24 38
24	13 14	24	26 23
25	15 58	25	28 03
26	18 44	26	29 40
27	21 30	27	1 14
28	24 17	28	2 46
29	27 06	29	4 16
30	0 VS 0	30	5 43

The Table of the Nonagesime Degree, for the Latitude of
53 Degrees 22 Minutes, continued.

Cusp 10. Aquarius °	Nona- gesime. °	Cusp 10. Pisces. °	Nona- gesime. °
0	5 43	0	6 54
1	7 05	1	7 42
2	8 25	2	8 28
3	9 45	3	9 17
4	11 01	4	10 01
5	12 17	5	10 46
6	13 29	6	11 31
7	14 40	7	12 15
8	15 49	8	12 59
9	16 59	9	13 43
10	18 07	10	14 26
11	19 14	11	15 10
12	20 18	12	15 53
13	21 21	13	16 36
14	22 24	14	17 19
15	23 25	15	18 01
16	24 25	16	18 44
17	25 25	17	19 25
18	26 23	18	20 07
19	27 20	19	20 48
20	28 16	20	21 29
21	29 11	21	22 10
22	0 04	22	22 51
23	0 58	23	23 32
24	1 51	24	24 12
25	2 43	25	24 52
26	3 35	26	25 32
27	4 25	27	26 13
28	5 13	28	26 53
29	6 05	29	27 32
30	6 54	30	28 11

A Table of the Nonagesime Degree for the Latitude of
54 Degrees.

R. A	Cusp Aries.	io.	Nona- gesime.	Cusp Taurus.	io.	Nona- gesime.	Ascen
		0	0		0	0	Ab
0-0	0		28 47	27 54	0	17 54	
0.55	1		29 27	28 57	1	18 33	
1.50	2		0 4	29 49	2	19 12	
2.45	3		0 42	30 46	3	19 51	
3-40	4		1 21	31 44	4	20 30	
4.35	5		1 59	32 42	5	21 09	
5.30	6		2 38	33 40	6	21 48	
6.25	7		3 16	34 39	7	22 27	
7.21	8		3 54	35 37	8	23 07	
8.16	9		4 32	36 36	9	23 46	
9.11	10		5 10	37 35	10	24 25	
10-6	11		5 48	38 34	11	25 05	
11.2	12		6 26	39 33	12	25 46	
11.57	13		7 04	40 32	13	26 26	
12.53	14		7 42	41 31	14	27 06	
13.48	15		8 21	42 31	15	27 46	
14.44	16		8 59	43 31	16	28 26	
15.40	17		9 37	44 31	17	29 08	
16.31	18		10 15	45 31	18	29 49	
17.35	19		10 53	46 32	19	0 II 29	17
18.27	20		11 31	47 33	20	I 10	
19.23	21		12 09	48 33	21	I 51	
20.20	22		12 47	49 34	22	2 32	
21.16	23		13 25	50 35	23	3 13	
22.12	24		14 03	51 36	24	3 54	
23-9	25		14 41	52 36	25	4 36	
24-6	26		15 20	53 40	26	5 18	
25.2	27		15 58	54 42	27	6 0	
25.59	28		16 37	55 44	28	6 42	
26.57	29		17 15	56 46	29	7 24	
27.54	30		17 54	57 48	30	8 06	

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 85-41
 86-46
 87-51
 88-56
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The Table of the Nonagesime Degree, for the Latitude of
54 Degrees, continu'd.

RA	Cusp 10. Gemini.	Nonage- sime.	Cusp 10. Cancer.	Nonage- sime.	Ascend
	°	'	RA	°	
57.48	0	8 11 6	90 0	0	0
58.57	1	8 49	91 5	1	45
59.54	2	9 31	92 11	2	29
60.57	3	10 14	93 16	3	14
62.0	4	10 56	94 22	4	58
63.3	5	11 39	95 27	5	43
64.6	6	12 22	96 32	6	27
65.9	7	13 05	97 38	7	12
66.13	8	13 49	98 43	8	57
67.17	9	14 32	99 43	9	41
68.21	10	15 16	100 48	10	25
69.25	11	15 59	101 53	11	10
70.28	12	16 43	103 3	12	54
71.33	13	17 26	104 8	13	38
72.38	14	18 10	105 13	14	22
73.43	15	18 54	106 17	15	06
74.47	16	19 38	107 22	16	50
75.52	17	20 22	108 26	17	34
76.57	18	21 06	109 31	18	17
78.2	19	21 50	110 35	19	01
79.7	20	22 35	111 39	20	44
80.12	21	23 19	112 43	21	18
81.17	22	24 03	113 47	22	11
82.22	23	24 48	114 51	23	41
83.27	24	25 33	115 54	24	38
84.33	25	26 17	116 57	25	21
85.38	26	27 02	118 1	26	04
86.43	27	27 46	119 4	27	46
87.48	28	28 31	120 7	28	29
88.54	29	29 15	121 9	29	11
90.0	30	9 50	122 12	30	54

The Table of the Nonagesime Degree, for the Latitude of
54 Degrees, continued.

R. A	Cusp 10. Leo.	Nona- gesime.	Cusp 10. Virgo.	Nona- gesime.
	0	0	0	0
122-12	0	21 54	152 6	12 6
123-14	1	22 36	153 3	12 45
124-16	2	13 18	154 0	13 23
125-18	3	24 0	155 57	14 02
126-20	4	24 42	156 34	14 40
127-22	5	25 24	157 11	15 19
128-24	6	26 6	157 48	15 57
129-25	7	26 47	158 25	16 35
130-26	8	27 28	159 0	17 13
131-27	9	28 09	160 37	17 51
132-28	10	28 50	161 14	18 29
133-28	11	29 31	162 29	19 07
134-29	12	0 12 12	163 25	19 45
135-29	13	0 53	164 21	20 23
136-29	14	1 34	165 17	21 01
137-29	15	2 14	166 12	21 39
138-29	16	2 54	167 8	22 18
139-28	17	3 34	168 3	22 56
140-28	18	4 14	169 19	23 34
141-27	19	4 55	170 54	24 12
142-26	20	5 35	171 44	24 50
143-25	21	6 14	172 45	25 28
144-23	22	6 53	173 40	26 06
145-22	23	7 33	174 35	26 44
146-20	24	8 12	175 30	27 22
147-18	25	8 51	176 25	28 01
148-16	26	9 30	177 20	28 39
149-14	27	10 09	178 15	29 18
150-11	28	10 48	179 10	29 56
151-9	29	11 27	180 5	0 35
152-6	30	12 06	180 0	1 13

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The Table of the Nonagesime Degree, for the Latitude of 54 Degrees, continued.

Cusp 10. Libra.	Nonage- sime.	Cusp 10. Scorpio.	Nonage- sime.	Adversus
	0		0	♄
180.0	0	0	22	♄ 14
180.55	1	1	23	02
181.50	2	2	23	50
182.45	3	3	24	59
183.40	4	4	25	29
184.35	5	5	26	19
185.30	6	6	27	10
186.26	7	7	28	02
187.21	8	8	28	55
188.16	9	9	29	49
189.11	10	10	0	43
190.6	11	11	1	38
191.2	12	12	2	34
192.57	13	13	3	30
192.57	14	14	4	27
193.48	15	15	5	26
194.44	16	16	6	26
195.40	17	17	7	27
196.36	18	18	8	30
197.32	19	19	9	34
198.28	20	20	10	40
199.24	21	21	11	47
200.20	22	22	12	55
201.16	23	23	14	04
202.13	24	24	15	15
203.9	25	25	16	28
204.6	26	26	17	43
205.3	27	27	18	59
206.0	28	28	20	17
207.57	29	29	21	38
208.54	30	30	23	03

The Table of the Nonagesime Degree, for the Latitude of
54 Degrees, continued.

	Cusp 10. Sagittary	Nonage- sime.		Cusp 10. Capricorn	Nonage- sime.	
237. 48	0	23 2		0	0 VS 0	
238 51	1	24 28		1	3 0	
239 54	2	25 56		2	5 57	
240 57	3	27 25		3	8 52	
241 59	4	28 57		4	11 46	
243 3	5	0 m 33		5	14 38	
	6	2 12		6	17 28	
	7	3 54		7	20 15	
	8	5 40		8	23 0	
	9	7 30		9	25 41	
	10	9 24		10	28 17	
	11	11 21		11	0 m 50	
	12	13 20		12	3 18	
	13	15 23		13	5 43	
	14	17 30		14	8 02	
	15	19 41		15	10 19	
	16	21 58		16	12 30	
	17	24 17		17	14 37	
	18	26 42		18	16 40	
	19	29 10		19	18 39	
	20	1 ↗ 43		20	20 36	
	21	4 19		21	22 30	
	22	7 10		22	24 20	
	23	9 45		23	26 06	
	24	12 32		24	27 48	
	25	15 22		25	29 27	
	26	18 14		26	1 26 3	
	27	21 8		27	2 35	
	28	24 3		28	4 04	
	29	27 0		29	5 32	
	30	0 VS 0		30	6 58	

The Table of the Nonagesime Degree, for the Latitude of
54 Degrees, continu'd.

Cusp 10. Aquarius			Nonage- sime.		Cusp 10. Pisces.			Nonage- sime.	
0	1	2	0	1	0	1	0	1	2
302 12	0	6	38	332 6	0	7	46		
303 16	1	8	22	333 3	1	8	33		
304 16	2	9	43	334 0	2	9	20		
305 18	3	11	01	334 57	3	10	06		
306 20	4	12	17	335 54	4	10	51		
307 22	5	13	32	336 51	5	11	36		
308 24	6	14	45	337 48	6	12	21		
309 25	7	15	56	338 45	7	13	06		
310 26	8	17	05	339 41	8	13	50		
311 27	9	18	13	340 37	9	14	34		
312 27	10	19	20	341 33	10	15	17		
313 28	11	20	26	342 29	11	16	0		
314 29	12	21	30	343 25	12	16	42		
315 29	13	22	33	344 21	13	17	24		
316 29	14	23	34	345 17	14	18	06		
317 29	15	24	34	346 12	15	18	47		
318 29	16	25	33	347 8	16	19	28		
319 28	17	26	30	348 3	17	20	09		
320 27	18	27	26	348 59	18	20	50		
321 26	19	28	22	349 54	19	21	31		
322 25	20	29	17	350 49	20	22	12		
323 24	21	0	11	351 45	21	22	52		
324 23	22	1	05	352 40	22	23	33		
325 21	23	1	58	353 35	23	24	13		
326 20	24	2	50	354 30	24	24	53		
327 18	25	3	41	355 25	25	25	32		
328 16	26	4	31	356 20	26	26	11		
329 14	27	5	21	357 15	27	26	50		
330 11	28	6	10	358 10	28	27	29		
331 9	29	6	58	359 5	29	28	08		
332 6	30	7	46	360 0	30	28	47		

A Table of the Nonagesime Degree, for the Latitude of 57 Degrees.

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Cusp 10. Aries.	Nonagesime.	Cusp 10. Taurus.	Nonagesime.
0	1 034	0	19 045
1	2 10	1	20 21
2	2 47	2	20 58
3	3 23	3	21 35
4	4 0	4	22 12
5	4 36	5	22 49
6	5 13	6	23 27
7	5 49	7	24 04
8	6 25	8	24 42
9	7 02	9	25 20
10	7 38	10	25 58
11	8 14	11	26 36
12	8 50	12	27 14
13	9 26	13	27 52
14	10 02	14	28 30
15	10 38	15	29 08
16	11 14	16	29 47
17	11 51	17	0 126 <i>22</i>
18	12 27	18	1 05
19	13 03	19	1 44
20	13 39	20	2 23
21	14 15	21	3 03
22	14 52	22	3 42
23	15 28	23	4 22
24	16 04	24	5 01
25	16 41	25	5 41
26	17 18	26	6 21
27	17 54	27	7 01
28	18 31	28	7 41
29	19 08	29	8 21
30	19 55	30	9 01

The Table of the Nonagesime Degree, for the Latitude of
57 Degrees, continued.

Mr S.

Cusp 10. Gemini. °	Nonage- sime. °	Cusp 10. Cancer. °	Nonage- sime. °
0	9 11 1	0	0 5 0
1	9 42	1	0 43
2	10 23	2	1 26
3	11 04	3	2 09
4	11 45	4	2 52
5	12 26	5	3 34
6	13 07	6	4 17
7	13 48	7	4 59
8	14 30	8	5 42
9	15 11	9	6 24
10	15 23	10	7 07
11	16 34	11	7 49
12	17 16	12	8 31
13	17 58	13	9 14
14	18 40	14	9 56
15	19 22	15	10 38
16	20 04	16	11 20
17	20 46	17	12 02
18	21 29	18	12 44
19	22 11	19	13 26
20	22 53	20	14 07
21	23 36	21	14 49
22	24 18	22	15 30
23	25 01	23	16 12
24	25 43	24	16 53
25	26 26	25	17 34
26	27 08	26	18 15
27	27 51	27	18 56
28	28 34	28	19 37
29	29 17	29	20 18
30	0 5 0	30	20 59

The Table of the Nonagesime Degree for the Latitude of 57 Degrees, continued.

Cusp 10. Leo.	Nonage- sime.	Cusp 10. Virgo.	Nonage- sime.
0	20 59	0	10 15
1	21 39	1	10 52
2	22 19	2	11 29
3	22 59	3	12 06
4	23 39	4	12 42
5	24 19	5	13 19
6	24 59	6	13 56
7	25 38	7	14 32
8	26 18	8	15 08
9	26 57	9	15 45
10	27 37	10	16 21
11	28 16	11	16 57
12	28 55	12	17 33
13	29 34	13	18 09
14	0 13	14	18 46
15	0 52	15	19 22
16	1 30	16	19 58
17	2 08	17	20 34
18	2 46	18	21 10
19	3 24	19	21 46
20	4 02	20	22 22
21	4 40	21	22 58
22	5 18	22	23 35
23	5 56	23	24 11
24	6 33	24	24 47
25	7 11	25	25 24
26	7 48	26	26 0
27	8 25	27	26 37
28	9 02	28	27 13
29	9 39	29	27 50
30	10 15	30	28 26

The Table of the Nonagesime Degree, for the Latitude of
57 Degrees, continued.

Cusp 10. Libra.	Nonage- sime.	Cusp 10. Scorpio	Nonage- sime.
0	28 26	0	18 08
1	29 03	1	18 52
2	29 40	2	19 37
3	0 16	3	20 23
4	0 53	4	21 09
5	1 30	5	21 56
6	2 07	6	22 44
7	2 44	7	23 32
8	3 22	8	24 21
9	3 59	9	25 11
10	4 37	10	26 01
11	5 15	11	26 52
12	5 53	12	27 44
13	6 31	13	28 37
14	7 10	14	29 31
15	7 49	15	0 26
16	8 28	16	1 21
17	9 07	17	2 18
18	9 47	18	3 16
19	10 27	19	4 15
20	11 07	20	5 15
21	11 48	21	6 17
22	12 29	22	7 20
23	13 10	23	8 24
24	13 51	24	9 30
25	14 33	25	10 38
26	15 15	26	11 49
27	15 58	27	13 02
28	16 41	28	14 16
29	17 24	29	15 32
30	18 08	30	16 50

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A Table of the Nonagesimal Degree, for the Latitude of 57 Degrees, continued.

Cusp 10. Sagittarius	Nonagesimal	Cusp 10. Capricorn	Nonagesimal
8 0 16 50		8 29 38 0 VS 0	
8 1 18 11		8 31 40 3 40	
8 2 19 35		8 32 16 7 16	
8 3 21 02		8 33 47 10 47	
8 4 22 32		8 34 16 14 16	
8 5 24 05		8 35 41 17 41	
8 6 25 42		8 36 01 21 01	
8 7 27 22		8 37 17 24 17	
8 8 29 05		8 38 26 27 26	
8 9 30 52		8 39 31 0 31	
8 10 32 45		8 40 30 3 30	
8 11 34 43		8 41 121 6 121	
8 12 36 46		8 42 9 104	
8 13 38 53		8 43 11 39	
8 14 41 07		8 44 14 10	
8 15 43 25		8 45 16 35	
8 16 45 50		8 46 18 53	
8 17 48 24		8 47 21 07	
8 18 50 36		8 48 23 14	
8 19 53 39		8 49 25 17	
8 20 26 30		8 50 27 15	
8 21 29 29		8 51 29 108	
8 22 32 34		8 52 31 0 355	
8 23 35 43		8 53 2 38	
8 24 38 59		8 54 4 18	
8 25 42 19		8 55 5 45	
8 26 45 44		8 56 7 28	
8 27 49 13		8 57 8 58	
8 28 52 44		8 58 10 25	
8 29 26 29		8 59 11 49	
8 30 30 VS 0		8 60 13 10	

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Cusp 10. Aquarius

The Table of the Nonagesimo Degree, for the Latitude of
57 Degrees, continued.

Cusp 10. Aquarius 0	Nonage- simo. 10	Cusp 10. Capricorn 0	Nonage- simo. 0
0	13 36	0	11 52
1	14 28	1	12 36
2	15 44	2	13 19
3	16 58	3	14 02
4	18 11	4	14 45
5	19 22	5	15 27
6	20 30	6	16 09
7	21 36	7	16 50
8	22 40	8	17 31
9	23 43	9	18 12
10	24 45	10	18 53
11	25 45	11	19 33
12	26 44	12	20 13
13	27 42	13	20 53
14	28 39	14	21 32
15	29 34	15	22 11
16	30 29	16	22 50
17	1 23	17	23 29
18	2 16	18	24 07
19	3 08	19	24 45
20	3 59	20	25 23
21	4 49	21	26 01
22	5 39	22	26 38
23	6 28	23	27 16
24	7 16	24	27 53
25	8 04	25	28 30
26	8 51	26	29 07
27	9 37	27	29 44
28	10 23	28	30 20
29	11 08	29	30 57
30	11 52	30	31 34

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Table of the Nonagesimo Degree, for the Latitude of 60 Degrees.

Cusp 10. Aries.	Nonage- sime.	Cusp 10. Taurus.	Nonage- sime.
0	4 039	0	21 043
1	5 13	1	22 18
2	5 47	2	22 53
3	6 21	3	23 28
4	6 55	4	24 04
5	7 29	5	24 39
6	8 03	6	25 15
7	8 37	7	25 50
8	9 11	8	26 26
9	9 44	9	27 02
10	10 18	10	27 38
11	10 52	11	28 14
12	11 26	12	28 50
13	12 00	13	29 26
14	12 34	14	0 03
15	13 08	15	0 39
16	13 42	16	1 16
17	14 16	17	1 52
18	14 50	18	2 29
19	15 24	19	3 06
20	15 58	20	3 43
21	16 32	21	4 21
22	17 07	22	4 59
23	17 41	23	5 36
24	18 16	24	6 14
25	18 50	25	6 52
26	19 25	26	7 29
27	19 59	27	8 07
28	20 34	28	8 45
29	21 08	29	9 24
30	21 43	30	10 02

The Table of the Nonagesime Degree, for the Latitude of
60 Degrees, continu'd.

Cusp 10. Gemini.	Nonage- sime.	Cusp 10. Cancer.	Nonage- sime.
0	10 2	0	0 0
1	10 40	1	0 41
2	11 19	2	1 22
3	11 58	3	2 03
4	12 37	4	2 43
5	13 16	5	3 23
6	13 55	6	4 04
7	14 35	7	4 45
8	15 14	8	5 25
9	15 54	9	6 06
10	16 33	10	6 46
11	17 13	11	7 27
12	17 52	12	8 07
13	18 32	13	8 48
14	19 12	14	9 28
15	19 52	15	10 08
16	20 32	16	10 48
17	21 12	17	11 28
18	21 53	18	12 08
19	22 33	19	12 47
20	23 14	20	13 27
21	23 54	21	14 06
22	24 35	22	14 46
23	25 15	23	15 25
24	25 56	24	16 05
25	26 37	25	16 44
26	27 17	26	17 33
27	27 57	27	18 02
28	28 38	28	18 41
29	29 19	29	19 20
30	0 0	30	19 58

The Table of the Nonageſime Degree for the Latitude of
60 Degrees, continued.

Cusp 10. Leo.	Nonageſime.	Cusp 10. Virgo.	Nonageſime.
0	12 58	0	8 17
1	20 36	1	8 52
2	21 15	2	9 26
3	21 53	3	10 01
4	22 31	4	10 35
5	23 08	5	11 10
6	23 46	6	11 44
7	24 24	7	12 19
8	25 01	8	12 53
9	25 39	9	13 28
10	26 17	10	14 02
11	26 54	11	14 36
12	27 31	12	15 10
13	28 08	13	15 44
14	28 44	14	16 18
15	29 21	15	16 52
16	29 57	16	17 26
17	0 34	17	18 00
18	1 10	18	18 34
19	1 46	19	19 08
20	2 22	20	19 42
21	2 58	21	20 16
22	3 34	22	20 49
23	4 10	23	21 23
24	4 45	24	21 57
25	5 21	25	22 31
26	5 56	26	23 05
27	6 32	27	23 39
28	7 07	28	24 13
29	7 42	29	24 47
30	8 17	30	25 21

The Table of the Nonagesime Degree, for the Latitude of 60 Degrees, continu'd.

Cusp 10. Libra. °	Nona- gesime. °	Cusp 10. Scorpio. °	Nona- gesime. °
0	25 21	0	13 29
1	25 55	1	14 09
2	26 30	2	14 50
3	27 04	3	15 31
4	27 38	4	16 12
5	28 13	5	16 54
6	28 47	6	17 36
7	29 21	7	18 19
8	29 56	8	19 03
9	0 31	9	19 47
10	1 06	10	20 32
11	1 42	11	21 17
12	2 17	12	22 03
13	2 53	13	22 50
14	3 28	14	23 38
15	4 04	15	24 27
16	4 40	16	25 17
17	5 16	17	26 07
18	5 52	18	26 58
19	6 29	19	27 50
20	7 05	20	28 44
21	7 42	21	29 39
22	8 19	22	30 35
23	8 57	23	31 32
24	9 33	24	32 31
25	10 13	25	33 32
26	10 52	26	34 34
27	11 31	27	35 38
28	12 10	28	36 43
29	12 49	29	37 51
30	13 29	30	38 01

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The Table of the Nonagesime Degree, for the Latitude of 60 Degrees, continu'd.

Cusp. 10. Sagittary	Nonagesime.	Cusp. 10. Capricorn	Nonagesime.
00	19 01	00	0 43 0
01	10 14	01	4 52
02	11 29	02	9 37
03	12 47	03	14 18
04	14 07	04	18 55
05	15 31	05	23 20
06	17 00	06	27 30
07	18 32	07	1 26
08	20 07	08	5 10
09	21 47	09	8 43
10	23 33	10	12 05
11	25 23	11	15 17
12	27 19	12	18 13
13	29 12	13	20 58
14	1 m 35	14	23 36
15	3 55	15	26 05
16	6 24	16	28 25
17	9 02	17	0 38
18	11 47	18	2 41
19	14 43	19	4 37
20	17 55	20	6 27
21	21 17	21	8 13
22	24 50	22	9 53
23	28 34	23	11 28
24	32 30	24	13 00
25	36 40	25	14 29
26	41 05	26	15 52
27	45 42	27	17 13
28	50 23	28	18 31
29	55 08	29	19 46
30	00 00	30	20 59

The Table of the Nonagesime Degree, for the Latitude of
60 Degrees, continued.

Cusp 10. <i>Aquarius</i> °	Nona- gesime. °	Cusp 10. <i>Pisces.</i> °	Nona- gesime. ° 1
0	20 59	0	16 61
1	22 09	1	17 11
2	23 17	2	17 50
3	24 22	3	18 29
4	25 26	4	19 08
5	26 28	5	19 47
6	27 29	6	20 25
7	28 28	7	21 03
8	29 25	8	21 41
9	0 21	9	22 18
10	1 16	10	22 55
11	2 10	11	23 31
12	3 02	12	24 08
13	3 53	13	24 44
14	4 43	14	25 20
15	5 33	15	25 56
16	6 22	16	26 32
17	7 10	17	27 07
18	7 57	18	27 43
19	8 43	19	28 18
20	9 28	20	28 54
21	10 13	21	29 29
22	10 57	22	08 04
23	11 41	23	0 59
24	12 24	24	1 13
25	13 06	25	1 47
26	13 48	26	2 22
27	14 29	27	2 56
28	15 10	28	3 30
29	15 51	29	4 05
30	16 31	30	4 39

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4

U R A N O S C O P I A

The Table of the Nonagesimal Degree for the Latitude of
60 Degrees, continued.

Nonagesimal Degree	Cap 10 Pigeon	Nonagesimal Degree	Cap 10 Pigeon
10 41	0	20 59	0
11 11	1	21 09	1
17 29	2	22 17	2
18 29	3	23 24	3
19 08	4	24 26	4
19 47	5	25 28	5
20 25	6	26 27	6
21 03	7	27 28	7
21 41	8	28 28	8
22 18	9	29 28	9
22 55	10	30 27	10
23 31	11	31 26	11
24 08	12	32 25	12
24 44	13	33 24	13
25 20	14	34 23	14
25 56	15	35 22	15
26 32	16	36 21	16
27 07	17	37 20	17
27 43	18	38 19	18
28 18	19	39 18	19
28 54	20	40 17	20
29 29	21	41 16	21
30 04	22	42 15	22
30 39	23	43 14	23
31 13	24	44 13	24
31 47	25	45 12	25
32 22	26	46 11	26
32 56	27	47 10	27
33 30	28	48 09	28
34 04	29	49 08	29
34 38	30	50 07	30

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Table of the Angles of the Nonagesime

Altitude	1	0	Altitude
30	67	68	30
27	67	68	27
24	67	68	24
21	67	68	21
18	67	68	18
15	67	68	15
12	67	68	12
9	67	68	9
6	67	68	6
3	67	68	3
0	67	68	0
31	67	68	31
28	67	68	28
25	67	68	25
22	67	68	22
19	67	68	19
16	67	68	16
13	67	68	13
10	67	68	10
7	67	68	7
4	67	68	4
1	67	68	1
32	67	68	32
29	67	68	29
26	67	68	26
23	67	68	23
20	67	68	20
17	67	68	17
14	67	68	14
11	67	68	11
8	67	68	8
5	67	68	5
2	67	68	2
33	67	68	33
30	67	68	30
27	67	68	27
24	67	68	24
21	67	68	21
18	67	68	18
15	67	68	15
12	67	68	12
9	67	68	9
6	67	68	6
3	67	68	3
0	67	68	0

TABLE
OF THE
ANGLE ORIENT,
OR
Altitude of the Nonagesime Degree.

4 Table of the Angle Orient, or Altitude of the Nonagesima
Degrees.

Ascen.	0	1	0	1	Ascen.
0	66	31	65	31	30
3	66	31	65	31	27
6	66	35	65	35	24
9	66	45	65	45	21
12	66	55	65	55	18
15	67	10	66	10	15
18	67	30	66	30	12
21	67	50	66	50	9
24	68	20	67	20	6
27	68	45	67	45	3
0	69	20	68	26	0
3	69	55	68	55	27
6	70	35	69	35	24
9	71	15	70	15	21
12	72	0	71	0	18
15	72	50	71	50	15
18	73	45	72	45	12
21	74	40	73	40	9
24	75	35	74	35	6
27	76	35	75	35	3
0	77	40	76	40	0
3	78	45	77	45	27
6	79	50	78	50	24
9	81	05	80	5	21
12	82	15	81	15	18
15	83	25	82	30	15
18	84	50	83	45	12
21	86	5	85	0	9
24	87	25	86	20	6
27	88	40	87	35	3
0	90	0	88	55	0

The Table of the Right Ascension, or Altitude of the Navigable Degree, continued.

Ascen.	0	1	2	3	Ascen.
06	96 00	88 55	30 45	27	
13	85 55	89 45	24	21	
18	87 25	88 30	18	15	
19	86 05	87 10	12	9	
12	84 50	85 55	6	3	
15	83 35	84 40	0	0	
18	82 20	83 25	27	24	
21	81 05	82 10	21	18	
24	80 05	81 05	15	12	
27	78 50	79 05	9	6	
0	77 35	78 45	3	0	
13	76 35	77 40	27	24	
18	75 35	76 40	21	18	
19	74 45	75 45	15	12	
12	73 50	74 50	9	6	
15	72 55	73 55	3	0	
18	72 00	73 15	27	24	
21	71 15	72 20	21	18	
24	70 30	71 35	15	12	
27	70 10	71 10	9	6	
0	69 25	70 25	3	0	
13	68 45	69 50	27	24	
18	68 20	69 20	21	18	
19	67 55	68 55	15	12	
12	67 30	68 30	9	6	
15	67 05	68 10	3	0	
18	66 55	67 55	27	24	
21	66 45	67 45	21	18	
24	66 35	67 35	15	12	
27	66 31	67 31	9	6	
0	66 31	67 31	3	0	

The Table of the *Angla Oriens*, or *Altitude* of the *Northern* Degrees, *continued*.

Ascen.	2	3	Ascen.
0	64 30	63 30	30
3	64 32	63 32	27
6	64 35	63 35	24
9	64 45	63 45	21
12	64 55	63 55	18
15	65 10	64 10	15
18	65 30	64 30	12
21	65 50	64 50	9
24	66 15	65 15	6
27	66 45	65 45	3
30	67 10	66 10	0
33	67 55	66 55	27
36	68 35	67 30	24
39	69 15	68 10	21
42	70 10	69 0	18
45	70 50	69 45	15
48	71 40	70 35	12
51	72 35	71 30	9
54	73 35	72 30	6
57	74 35	73 30	3
60	75 35	74 30	0
63	76 40	75 35	27
66	77 50	76 45	24
69	79 0	77 50	21
72	80 10	79 05	18
75	81 25	80 20	15
78	82 40	81 35	12
81	83 55	82 50	9
84	85 15	84 10	6
87	86 30	85 25	3
90	87 50	86 45	0

The Table

Asc

5

n

m

m

The Table of the Angle Orient, or Altitude of the Nonagesime Degree, continued.

Ascen.	2	3	Ascen.
0	87 50	86 45	30 VS
3	89 5	88 0	27
6	89 35	89 20	24
9	88 35	89 20	21
12	87 10	88 5	18
15	85 45	86 50	15
18	84 30	85 35	12
21	83 35	84 20	9
24	82 5	83 10	6
27	81 0	82 0	3
0	79 55	80 50	0
3	78 45	79 50	27
6	77 45	78 50	24
9	76 45	77 50	21
12	75 50	76 50	18
15	75 0	76 0	15
18	74 10	75 10	12
21	73 20	74 25	9
24	72 40	73 40	6
27	72 0	73 0	3
0	71 25	72 25	0
3	70 55	71 50	27
6	70 20	71 20	24
9	69 55	70 55	21
12	69 30	70 30	18
15	69 15	70 15	15
18	68 55	69 55	12
21	68 45	69 45	9
24	68 35	69 35	6
27	68 31	69 31	3
	68 31	69 31	0

The Table of the Angle Orient, or Altitude of the Nonagesimal Degree, continued.

Alt. n.	4	5	Alt. n.
0	62 30	61 30	50 00
3	62 32	61 33	27
6	62 35	61 35	24
9	62 45	61 45	21
12	62 55	61 55	18
15	63 10	62 10	15
18	63 20	62 20	12
21	63 30	62 30	9
24	64 15	63 15	6
27	64 45	63 45	3
0	65 15	64 15	0
3	65 50	64 50	27
6	66 30	65 30	24
9	67 10	66 10	21
12	67 55	66 55	18
15	68 45	67 40	15
18	69 35	68 30	12
21	70 30	69 25	9
24	71 25	70 20	6
27	72 25	71 20	3
0	73 25	72 25	0
3	74 30	73 30	27
6	75 40	74 40	24
9	76 50	75 50	21
12	78 0	76 50	18
15	79 15	78 10	15
18	80 30	79 05	12
21	81 45	80 40	9
24	83 05	81 55	6
27	84 20	83 15	3
0	85 40	84 30	0

The Table of the Angle Orient, or Altitude of the Nonagesime
Degree, continued.

Ascen.	4	5	Ascen.
0	85 40	84 30	0 v3
3	86 50	85 50	27
6	88 15	87 10	24
9	89 30	88 25	21
12	89 10	89 45	18
15	87 55	89 0	15
18	86 40	87 45	12
21	85 25	86 30	9
24	84 15	85 20	6
27	83 5	84 10	3
0	82 0	83 5	0
3	80 55	82 0	27
6	79 50	80 55	24
9	78 55	79 55	21
12	77 55	79 0	18
15	77 5	78 5	15
18	76 15	77 15	12
21	75 25	76 30	9
24	74 45	75 45	6
27	74 5	75 5	3
0	73 25	74 25	0 m
3	72 55	73 55	27
6	72 25	73 25	24
9	71 55	72 55	21
12	71 35	72 35	18
15	71 15	72 15	15
18	71 0	72 0	12
21	70 45	71 45	9
24	70 35	71 35	6
27	70 30	71 30	3
0	70 30	71 30	0

The Table of the Angle Orient, or Altitude of the Nonagesimal Degree, continued.

Ascen.	6	7	Ascen.
0	0	0	0
3	60 30	59 30	30 0
6	60 32	59 33	27
9	60 35	59 35	24
12	60 45	59 45	21
15	60 55	59 55	18
18	61 10	60 10	15
21	61 30	60 30	12
24	61 50	60 50	9
27	62 15	61 15	6
30	62 40	61 40	3
33	63 15	62 10	0 *
36	63 50	62 45	27
39	64 25	63 25	24
42	65 25	64 5	21
45	65 55	64 45	18
48	66 35	65 35	15
51	67 25	66 25	12
54	68 20	67 20	9
57	69 20	68 15	6
60	70 20	69 15	3
63	71 20	70 15	0 **
66	72 25	71 20	27
69	73 35	72 25	24
72	74 40	73 35	21
75	75 50	74 45	18
78	77 5	76 0	15
81	78 20	77 15	12
84	79 35	78 30	9
87	80 50	79 45	6
90	82 10	81 5	3
93	83 25	82 20	0 **

The Table of the Angle Orient, or Altitude of the Nonagesime Degree, continued.

Afcen.	6	7	Afcen.
0	83 5	82 20	30 vs
3	84 45	83 40	27
6	86 5	85 0	24
9	87 25	86 15	21
12	88 35	87 35	18
15	89 55	88 50	15
18	88 50	89 55	12
21	87 35	88 45	9
24	86 25	87 30	6
27	85 15	86 20	3
0	84 5	85 10	0 ↗
3	83 0	84 5	27
6	82 0	83 0	24
9	81 0	82 5	21
12	80 5	81 5	18
15	79 10	80 10	15
18	78 20	79 20	12
21	77 30	78 35	9
24	76 45	77 50	6
27	76 5	77 10	3
0	75 30	76 30	0 m
3	74 55	75 55	27
6	74 25	75 25	24
9	73 55	74 55	21
12	73 30	74 35	18
15	73 15	74 15	15
18	73 0	74 0	12
21	72 45	73 45	9
24	72 35	73 35	6
27	72 30	73 30	3
0	72 30	73 30	0 12

The Table of the Angle Orient, or Altitude of the Nonagesima
Degree, continued.

Ascen.	8	9	Ascen.
<u>0</u>	<u>58</u>	<u>57</u>	<u>30</u>
<u>3</u>	<u>58</u>	<u>57</u>	<u>27</u>
<u>6</u>	<u>58</u>	<u>57</u>	<u>24</u>
<u>9</u>	<u>58</u>	<u>57</u>	<u>21</u>
<u>12</u>	<u>58</u>	<u>57</u>	<u>18</u>
<u>15</u>	<u>59</u>	<u>58</u>	<u>15</u>
<u>18</u>	<u>59</u>	<u>58</u>	<u>12</u>
<u>21</u>	<u>59</u>	<u>58</u>	<u>9</u>
<u>24</u>	<u>60</u>	<u>59</u>	<u>6</u>
<u>27</u>	<u>60</u>	<u>59</u>	<u>3</u>
<u>0</u>	<u>61</u>	<u>60</u>	<u>0</u>
<u>3</u>	<u>61</u>	<u>60</u>	<u>27</u>
<u>6</u>	<u>62</u>	<u>61</u>	<u>24</u>
<u>9</u>	<u>63</u>	<u>62</u>	<u>21</u>
<u>12</u>	<u>63</u>	<u>62</u>	<u>18</u>
<u>15</u>	<u>64</u>	<u>63</u>	<u>15</u>
<u>18</u>	<u>65</u>	<u>64</u>	<u>12</u>
<u>21</u>	<u>66</u>	<u>65</u>	<u>9</u>
<u>24</u>	<u>67</u>	<u>66</u>	<u>6</u>
<u>27</u>	<u>68</u>	<u>67</u>	<u>3</u>
<u>0</u>	<u>69</u>	<u>68</u>	<u>0</u>
<u>3</u>	<u>70</u>	<u>69</u>	<u>27</u>
<u>6</u>	<u>71</u>	<u>70</u>	<u>24</u>
<u>9</u>	<u>72</u>	<u>71</u>	<u>21</u>
<u>12</u>	<u>73</u>	<u>72</u>	<u>18</u>
<u>15</u>	<u>74</u>	<u>73</u>	<u>15</u>
<u>18</u>	<u>76</u>	<u>75</u>	<u>12</u>
<u>21</u>	<u>77</u>	<u>76</u>	<u>9</u>
<u>24</u>	<u>78</u>	<u>77</u>	<u>6</u>
<u>27</u>	<u>80</u>	<u>78</u>	<u>3</u>
<u>0</u>	<u>81</u>	<u>80</u>	<u>0</u>

The Table of the Angle Orient, or Altitude of the Nonagesimo Degree, continu'd.

Ascen.	8	9	Ascen.
0	81 15	80 10	30 43
3	82 35	81 30	27
6	83 50	82 45	24
9	85 10	84 5	21
12	86 25	85 20	18
15	87 45	86 40	15
18	89 0	87 55	12
21	89 45	89 10	9
24	88 35	89 40	6
27	87 25	88 25	3
0	86 15	87 20	0
3	85 10	86 15	27
6	84 5	85 10	24
9	83 5	84 10	21
12	82 10	83 10	18
15	81 15	82 15	15
18	80 25	81 25	12
21	79 35	80 35	9
24	78 50	79 50	6
27	78 10	79 5	3
0	77 30	78 30	0
3	76 55	77 55	27
6	76 25	77 25	24
9	76 0	77 0	21
12	75 35	76 35	18
15	75 15	76 15	15
18	75 0	76 0	12
21	74 45	75 45	9
24	74 35	75 35	6
27	74 30	75 30	3
0	74 20	75 20	0

The Table of the Angle Orient, or Altitude of the Nonagesime Degree, continued.

Afcen.		I Q		I X		Afcen.
°		°	1	°	1	°
γ 0		56	31	55	31	30 0
3		56	31	55	31	27
6		56	35	55	35	24
9		56	45	55	45	21
12		56	55	55	55	18
15		57	10	56	10	15
18		57	25	56	25	12
21		57	45	56	45	9
24		58	10	57	10	6
27		58	40	57	40	3
δ 0		59	10	58	10	0 *
3		59	45	58	45	27
6		60	20	59	15	24
9		61	0	59	55	21
12		61	40	60	40	18
15		62	25	61	25	15
18		63	15	62	15	12
21		64	10	63	05	9
24		65	5	64	0	6
27		66	5	65	0	3
ι 0		67	5	66	0	0 ~
3		68	5	67	05	27
6		69	15	68	10	24
9		70	20	69	15	21
12		71	30	70	25	18
15		72	40	71	35	15
18		73	55	72	0	12
21		75	15	74	10	9
24		76	30	75	25	6
27		77	45	76	40	3
θ 0		79	5	78	0	0 vs

A Table of the Angle Orient, or Altitude of the Nonaagesime Degree, continued.

Ascen.	10	11	Ascen.
°	°	°	°
<u>95</u> 0	79 5	78 0	0 <u>v3</u>
3	80 25	79 20	27
6	81 45	80 35	24
9	82 50	81 55	21
12	84 15	83 10	18
15	85 35	84 30	15
<u>18</u>	86 50	85 45	12
21	88 5	87 0	9
24	89 20	88 15	6
27	89 10	89 25	3
<u>2</u> 0	88 25	89 25	0 <u>2</u>
3	87 20	88 20	27
<u>6</u>	86 15	87 20	24
9	85 10	86 15	21
12	84 15	85 20	18
15	83 20	84 25	15
18	82 25	83 30	12
21	81 40	82 40	9
<u>24</u>	80 55	81 55	6
27	80 10	81 15	3
<u>7</u> 0	79 35	80 35	0 <u>m</u>
3	78 55	79 0	27
6	78 25	79 25	24
9	78 0	79 0	21
<u>12</u>	77 35	78 35	18
15	77 15	78 15	15
18	77 0	78 0	12
21	76 45	77 45	9
24	76 35	77 35	6
27	76 30	77 30	3
<u>8</u> 0	76 30	77 30	0 <u>1</u>

The Table of the Angle Orient, or Altitude of the Nonagesimal Degree, continued.

Ascen.	12	33	Ascen.
0	54 30	53 30	30 0
3	54 30	53 30	27
6	54 35	53 35	24
9	54 45	53 45	21
12	54 55	53 55	18
15	55 10	54 10	15
18	55 25	54 25	12
21	55 45	54 45	9
24	56 10	55 10	6
27	56 35	55 35	3
30	57 5	56 5	0
33	57 40	56 40	27
36	58 15	57 15	24
39	58 55	57 50	21
42	59 31	58 35	18
45	60 21	59 20	15
48	61 10	60 10	12
51	62 7	61 0	9
54	63 0	61 55	6
57	63 50	62 50	3
60	64 55	63 50	0
63	66 0	64 55	27
66	67 5	66 0	24
69	68 10	67 5	21
72	69 20	68 15	18
75	70 30	69 30	15
78	71 45	70 40	12
81	73 0	71 55	9
84	74 30	73 15	6
87	75 35	74 30	3
90	76 55	75 50	0

The Table of the Angle Orient, or Altitude of the Nonagesime Degree, continued.

Ascen.	12	13	Ascen.
0	0	0	0
3	76 55	75 50	27
6	78 10	77 5	24
9	79 30	78 25	21
12	80 50	79 45	18
15	82 5	81 0	15
18	83 25	82 15	12
21	84 40	83 35	9
24	85 55	84 50	6
27	87 10	86 5	3
0	88 20	87 15	0
3	89 30	88 25	27
6	89 25	89 25	24
9	88 20	89 20	21
12	87 20	88 20	18
15	86 20	87 25	15
18	85 25	86 30	12
21	84 35	85 35	9
24	83 40	84 45	6
27	83 0	84 0	3
0	82 15	83 15	0
3	81 35	82 35	27
6	81 0	82 0	24
9	80 25	81 30	21
12	80 0	81 0	18
15	79 35	80 35	15
18	79 15	80 15	12
21	79 0	80 0	9
24	78 45	79 45	6
27	78 40	79 40	3
0	78 31	79 31	0
3	78 31	79 31	

A Table of the Angle Orient, or Altitude of the Nonagesime Degree.

Ascen. °	14	15	Ascen. °
<u>γ</u> 0	52 31	51 31	0 <u>γ</u>
3	52 31	51 31	27
6	52 35	51 35	24
9	52 45	51 45	21
12	52 55	51 55	18
15	53 5	52 5	15
18	53 25	52 25	12
21	53 45	52 45	9
24	54 5	53 5	6
27	54 35	53 35	3
<u>δ</u> 0	55 5	54 0	0 <u>δ</u>
3	55 35	54 35	27
6	56 10	55 10	24
9	56 50	55 50	21
12	57 30	56 30	18
15	58 15	57 15	15
18	59 5	58 0	12
21	59 55	58 55	9
24	60 50	59 50	6
27	61 50	60 45	3
<u>ι</u> 0	62 45	61 40	0 <u>ι</u>
3	63 50	62 45	27
6	64 55	63 50	24
9	66 0	64 55	21
12	67 10	66 5	18
15	68 20	67 15	15
18	69 35	68 30	12
21	70 50	69 45	9
24	72 5	71 0	6
27	73 25	72 20	3
<u>θ</u> 0	74 40	73 35	0 <u>θ</u>

The Table of the Angle Orient, or Altitude of the Nonagesime Degree, continued.

Afcen.	14	15	Afcen.
°	°	°	°
0	74 40	73 35	0 VS
3	76 0	74 55	27
6	77 20	76 15	24
9	78 40	77 35	21
12	79 55	78 50	18
15	81 10	80 5	15
18	82 30	81 25	12
21	83 0	82 40	9
24	85 0	83 55	6
27	86 10	85 5	3
0	87 20	86 15	0 ✓
3	88 30	87 25	27
6	89 35	88 30	24
9	89 25	89 30	21
12	88 25	89 30	18
15	87 30	88 35	15
18	86 40	87 40	12
21	85 45	86 55	9
24	85 0	86 5	6
27	84 0	85 20	3
0	83 40	84 40	0 m
3	83 0	84 5	27
6	82 30	83 20	24
9	82 0	83 0	21
12	81 35	82 40	18
15	81 15	82 20	15
18	81 0	82 0	12
21	80 45	81 45	9
24	80 40	81 40	6
27	80 31	81 31	3
0	80 31	81 31	0

The Table of the Angle Orient, or Altitude of the Nonagesim
Degree, continued.

Ascen. °	16	17	Ascen. °
<u>0</u>	<u>50 31</u>	<u>49 31</u>	<u>0</u> γ
3	50 31	49 31	27
6	50 35	49 35	24
9	50 50	49 40	21
12	50 50	49 50	18
15	51 5	50 5	15
18	51 25	50 25	12
21	51 45	50 40	9
24	52 5	51 5	6
27	53 50	51 30	3
δ 0	53 0	52 0	0 κ
3	53 35	52 30	27
6	54 10	53 5	24
9	54 45	53 45	21
12	55 25	54 20	18
15	56 10	55 5	15
18	56 55	55 55	12
21	57 50	56 45	9
24	58 45	57 45	6
27	59 40	58 40	3
Π 0	60 40	59 35	0 ω
3	61 40	60 35	27
6	62 45	61 40	24
9	63 50	62 45	21
12	65 0	63 55	18
15	66 10	65 5	15
18	67 25	66 20	12
21	68 40	67 35	9
24	69 45	68 50	6
27	71 15	70 5	3
Θ 0	72 30	71 25	0 $\nu\varsigma$

The Table of the Angle Orient, or Altitude of the Nonagesimo Degree, continued.

Ascen.	16	17	Ascen.
0	72 30	71 25	0 vs
3	73 0	72 45	27
6	75 10	74 0	24
9	76 25	75 20	21
12	77 45	76 40	18
15	79 0	77 50	15
18	80 20	79 15	12
21	81 35	80 30	9
24	82 50	81 45	6
27	84 0	82 50	3
0	85 10	84 10	0
3	86 20	85 15	27
6	87 25	86 20	24
9	88 30	87 25	21
12	89 25	88 25	18
15	89 40	89 20	15
18	88 45	89 45	12
21	87 50	88 50	9
24	87 0	88 5	6
27	86 20	87 25	3
0	85 40	86 45	0 m
3	85 5	86 5	27
6	84 30	85 35	24
9	84 5	85 5	21
12	83 40	84 40	18
15	83 20	84 20	15
18	83 0	84 0	12
21	82 45	83 45	9
24	82 40	83 40	6
27	82 31	83 31	3
0	82 31	83 31	0

The Table of the Angle Orient, or Altitude of the Nonagesime Degree, continued.

Ascen.	18	19	Ascen.
0	48 31	47 31	0
3	48 31	47 31	27
6	48 35	47 35	24
9	48 40	47 40	21
12	48 50	47 50	18
15	49 5	48 5	15
18	49 25	48 20	12
21	49 40	48 40	9
24	50 5	49 5	6
27	50 30	49 30	3
0	51 0	49 50	0
3	51 33	50 30	27
6	52 5	51 5	24
9	52 40	51 40	21
12	53 25	52 20	18
15	54 5	53 5	15
18	54 55	53 50	12
21	55 45	54 40	9
24	56 35	55 30	6
27	57 30	56 25	3
0	58 30	57 25	0
3	59 30	58 25	27
6	60 35	59 30	24
9	61 40	60 35	21
12	62 50	61 45	18
15	64 0	62 55	15
18	65 15	64 10	12
21	66 30	65 20	9
24	67 45	66 40	6
27	69 0	67 55	3
0	70 20	69 10	0

The Table of the Angle Oriens, or Altitude of the Nonagesime Degree, continued.

Ascen. °	18 °	19 °	Ascen. °
0	70 20	69 10	0 v3
3	71 35	70 30	27
6	72 55	71 50	24
9	74 15	73 10	21
12	75 35	74 25	18
15	76 50	75 45	15
18	78 5	77 0	12
21	79 25	78 20	9
24	80 40	79 35	6
27	81 55	80 45	3
0	83 5	82 0	0
3	84 10	83 5	27
6	85 15	84 15	24
9	86 20	85 15	21
12	87 20	86 20	18
15	88 15	87 15	15
18	89 15	88 10	12
21	89 55	89 5	9
24	89 10	89 50	6
27	88 25	89 25	3
0	87 45	88 45	0 m
3	87 10	88 10	27
6	86 35	87 35	24
9	86 5	87 5	21
12	85 40	86 40	18
15	85 10	86 20	15
18	85 0	86 0	12
21	84 45	85 45	9
24	84 40	85 40	6
27	84 31	85 31	3
0	84 31	85 31	0

The Table of the Angle Orient, or Altitude of the Nonagesime
Degree, continued.

Ascen.		20		21		Ascen.
0		0	1	0	1	0
γ 0		46	31	45	31	0 γ
3		46	31	45	31	27
6		46	35	45	35	24
9		46	40	45	40	21
12		46	50	45	50	18
15		47	05	46	5	15
18		47	20	46	20	12
21		47	40	46	40	9
24		48	5	47	0	6
27		48	25	47	25	3
δ 0		48	55	47	55	0 κ
3		49	25	48	25	27
6		50	0	49	0	24
9		50	40	49	35	21
12		51	15	50	15	18
15		52	0	50	55	15
18		52	45	51	40	12
21		53	35	52	30	9
24		54	30	53	25	6
27		55	25	54	20	3
ϵ 0		56	20	55	15	0 ω
3		57	20	56	35	27
6		58	25	57	20	24
9		59	30	58	25	21
12		60	40	59	35	18
15		61	55	60	45	15
18		63	0	61	50	12
21		64	15	63	10	9
24		65	30	64	25	6
27		66	50	65	40	3
ζ 0		68	5	67	0	0 ν

The Table of the Angle Orient, or Altitude of the Nonagesimo Degree, continu'd.

Ascen.	20	21	Ascen.
0	68 5	67 0	0
3	69 25	68 20	27
6	70 45	69 40	24
9	72 5	70 55	21
12	73 20	72 15	18
15	74 40	73 35	15
18	75 55	74 50	12
21	77 15	76 10	9
24	78 30	77 25	6
27	79 40	78 40	3
0	80 55	79 50	0
3	82 5	81 0	27
6	83 5	82 5	24
9	84 15	83 10	21
12	85 15	84 10	18
15	86 15	85 10	15
18	87 10	86 5	12
21	88 0	87 0	9
24	88 50	87 45	6
27	89 35	88 30	3
0	89 45	89 10	0
3	89 10	89 50	27
6	88 35	89 35	24
9	88 5	89 5	21
12	87 40	88 40	18
15	87 20	88 20	15
18	87 0	88 0	12
21	86 45	87 45	9
24	86 40	87 40	6
27	86 31	87 31	3
0	86 31	87 31	0

The Table of the Angle Orient, or Altitude of the Nonagesime Degree, continued.

Ascen.	22	23	Ascen.
0	0	0	0
3	44 31	43 31	30
6	44 31	43 31	27
9	44 33	43 33	24
12	44 40	43 40	21
15	44 50	43 50	18
18	45 5	44 5	15
21	45 20	44 20	12
24	45 40	44 40	9
27	46 0	45 0	6
30	46 25	45 25	3
33	46 50	45 50	0
36	47 25	46 25	27
39	48 0	46 55	24
42	48 35	47 30	21
45	49 10	48 10	18
48	49 55	48 55	15
51	50 40	49 35	12
54	51 30	50 25	9
57	52 20	51 20	6
60	53 15	52 10	3
63	54 10	53 5	0
66	55 10	54 5	27
69	56 15	55 10	24
72	57 20	56 15	21
75	58 25	57 20	18
78	59 35	58 30	15
81	60 50	59 45	12
84	62 5	60 55	9
87	63 20	62 15	6
90	64 35	63 30	3
93	65 55	64 45	0

The Table of the Angle Orient, or Altitude of the Nonagesime Degree, continued.

Ascen.	22	23	Ascen.
0	0	0	0
3	65 55	64 45	VS
6	67 10	66 5	27
9	68 30	67 25	24
12	69 50	68 45	21
15	71 10	70 5	18
18	72 30	71 10	15
21	73 45	72 40	12
24	75 5	74 0	9
27	75 20	75 15	6
0	77 35	76 30	3
3	78 45	77 40	0
6	79 0	78 50	27
9	81 55	80 0	24
12	82 5	81 5	21
15	83 10	82 5	18
18	84 5	83 5	15
21	85 5	84 0	12
24	85 55	84 55	9
27	86 45	85 40	6
0	87 30	86 25	3
3	88 30	87 10	0
6	88 50	87 45	27
9	89 25	88 20	24
12	89 55	88 50	21
15	89 40	89 15	18
18	89 20	89 40	15
21	89 0	89 55	12
24	88 45	89 45	9
27	88 40	89 40	6
0	88 31	89 31	3
3	88 31	89 31	0

The Table of the Angle Orient, or Altitude of the Nonagesima Degree, continued.

Ascen.		23° 29'		24		Ascen.
γ	0	43 2		42 31		0 γ
	3	43 2		42 31		27
	6	43 5		42 35		24
	9	43 10		42 40		21
	12	43 20		42 50		18
	15	43 35		43 5		15
	18	43 50		43 20		12
	21	44 5		43 35		9
	24	44 25		43 55		6
	27	44 50		44 20		3
δ	0	45 20		45 50		0 δ
	3	45 50		45 20		27
	6	46 25		45 50		24
	9	47 0		46 25		21
	12	47 35		47 5		18
	15	48 15		47 55		15
	18	49 5		48 30		12
	21	49 50		49 20		9
	24	50 45		50 15		6
	27	51 55		51 5		3
ε	0	52 30		52 0		0 ε
	3	53 30		53 0		27
	6	54 35		54 5		24
	9	55 40		55 10		21
	12	56 50		56 15		18
	15	58 0		57 30		15
	18	59 10		58 40		12
	21	60 20		59 50		9
	24	61 35		61 5		6
	27	62 50		62 20		3
ς	0	64 10		63 45		0 ς

The Table of the Angle Orient, or Altitude of the Nonagesimo Degree, continued.

Ascen. °	23 29'	24	Ascen. °
<u>5</u> 0	64 10	63 45	0 VS
3	65 30	65 0	27
6	66 50	66 20	24
9	68 10	67 35	21
12	69 30	68 55	18
<u>15</u>	<u>70 45</u>	<u>70 15</u>	<u>15</u>
18	72 5	71 35	12
21	73 25	72 50	9
24	74 40	74 10	6
27	75 55	75 25	3
<u>♌</u> 0	<u>77 5</u>	<u>76 35</u>	<u>0</u> ♏
3	78 15	77 45	27
6	79 20	78 50	24
9	80 30	80 0	21
12	81 33	81 0	18
15	82 30	82 0	15
18	83 30	83 0	12
<u>21</u>	<u>84 20</u>	<u>83 50</u>	<u>9</u>
24	85 10	84 40	6
27	85 55	85 25	3
<u>♍</u> 0	<u>86 35</u>	<u>86 10</u>	<u>0</u> ♎
3	87 15	86 45	27
6	87 55	87 20	24
9	88 20	87 50	21
12	88 45	88 15	18
15	89 10	88 35	15
18	89 25	88 55	12
21	89 40	89 15	9
24	89 50	89 20	6
27	89 55	89 29	3
<u>♎</u> 0	<u>90 0</u>	<u>89 29</u>	<u>0</u> ♏

The Table of the Angle Orient, or Altitude of the Nonagesime Degree, continued.

Ascen.	25	26	Ascen.
	0	0	0
γ 0	41 31	40 31	0 γ
3	41 31	40 31	27
6	41 35	40 35	24
9	41 40	40 40	21
12	41 50	40 50	18
15	42 5	41 5	15
18	42 20	41 20	12
21	42 35	41 35	9
24	42 55	41 55	6
27	43 20	42 20	3
δ 0	43 50	42 45	0 ✕
3	44 20	43 15	27
6	44 50	43 50	24
9	45 25	44 25	21
12	46 5	45 0	18
15	46 45	45 40	15
18	47 30	46 25	12
21	48 20	47 15	9
24	49 10	48 5	6
27	50 0	48 55	3
ι 0	50 55	49 50	0 ≈
3	51 55	50 50	27
6	53 0	51 55	24
9	54 5	52 55	21
12	55 10	54 5	18
15	56 20	55 15	15
18	57 30	56 25	12
21	58 45	57 35	9
24	60 0	58 50	6
27	61 15	60 10	3
θ 0	62 35	61 25	0 vs

The Table of the Angle Orient, or Altitude of the Nonagesime Degree, continued.

Ascen.	25	26	Ascen.
0	62 35	61 25	0 VS
3	63 50	62 45	27
6	65 10	64 5	24
9	66 30	65 25	21
12	67 50	66 45	18
15	69 30	68 5	15
18	70 30	69 25	12
21	71 45	70 40	9
24	73 5	71 55	6
27	74 15	73 15	3
0	75 30	74 25	0
3	76 45	75 35	27
6	77 50	76 45	24
9	78 55	77 50	21
12	80 0	78 55	18
15	81 0	79 50	15
18	81 50	80 50	12
21	82 50	81 45	9
24	83 35	82 25	6
27	84 25	83 20	3
0	85 5	84 5	0
3	85 45	84 40	27
6	86 20	85 15	24
9	86 30	85 50	21
12	87 15	86 15	18
15	87 40	86 35	15
18	87 55	86 55	12
21	88 15	87 15	9
24	88 20	87 20	6
27	88 29	87 29	3
0	88 29	87 29	0

The Table of the Angle Orient, or Altitude of the Nonagesimal Degree, continued.

Ascen.	27	28	Ascen.
0	39 31	38 31	0
3	39 31	38 31	27
6	39 35	38 35	24
9	39 40	38 40	21
12	39 50	38 50	18
15	40 5	39 5	15
18	40 20	39 20	12
21	40 35	39 35	9
24	40 55	39 55	6
27	41 20	40 15	3
0	41 45	40 45	0
3	42 15	41 10	27
6	42 45	41 45	24
9	43 20	42 20	21
12	43 55	42 55	18
15	44 35	43 35	15
18	45 20	44 15	12
21	46 10	45 5	9
24	47 15	45 50	6
27	47 45	46 40	3
0	48 50	47 40	0
3	49 55	48 40	27
6	51 0	49 40	24
9	52 0	50 45	21
12	53 0	51 50	18
15	54 0	52 0	15
18	55 15	54 10	12
21	56 30	55 25	9
24	57 55	56 35	6
27	59 0	57 55	3
0	60 20	59 10	0

The Table of the Angle Orient, or Altitude of the Nonagesime Degree, continued.

Afcen.	27	28	Afcen.
°	°	°	°
0	60 20	59 10	0 VS
3	61 40	60 30	27
6	63 0	61 50	24
9	64 15	63 10	21
12	65 35	64 30	18
15	66 55	65 50	15
18	68 15	67 10	12
21	69 50	68 30	9
24	70 35	69 45	6
27	72 10	71 0	3
0	73 20	72 15	0 ♄
3	74 30	73 25	27
6	75 40	74 35	24
9	76 50	75 45	21
12	77 50	76 45	18
15	78 50	77 50	15
18	79 50	78 40	12
21	80 45	79 45	9
24	81 35	80 30	6
27	82 20	81 20	3
0	83 5	82 0	0 ♃
3	83 40	82 40	27
6	84 15	83 15	24
9	84 50	83 50	21
12	85 15	84 15	18
15	85 35	84 35	15
18	85 55	84 55	12
21	86 15	85 15	9
24	86 20	85 20	6
27	86 29	85 29	3
0	86 29	85 29	0 ♃

A Table of the Angle Orient, or Altitude of the Nonagesimo Degree, continued.

Ascen.	29	30	Ascen.
0	37 31	36 31	0
3	37 31	36 31	27
6	37 35	36 35	24
9	37 40	36 40	21
12	37 50	36 50	18
15	38 0	37 0	15
18	38 15	37 15	12
21	38 35	37 35	9
24	38 55	37 50	6
27	39 15	38 15	3
0	39 40	38 40	0
3	40 10	39 10	27
6	40 40	39 40	24
9	41 15	40 15	21
12	41 55	40 50	18
15	42 30	41 30	15
18	43 15	42 10	12
21	44 0	42 55	9
24	44 50	43 45	6
27	45 40	44 35	3
0	46 35	45 30	0
3	47 35	46 30	27
6	48 35	47 30	24
9	49 40	48 30	21
12	50 45	49 40	18
15	51 50	50 45	15
18	53 5	51 55	12
21	54 15	53 10	9
24	55 30	54 25	6
27	56 45	55 40	3
0	58 5	57 0	0

The Table of the Angle Orient, or Altitude of the Ninesime Degree, continued.

Ascen.	29	30	Ascen.
0	0 0 1	0 0 1	0
3	58 25	57 40	0 VS
6	59 25	58 15	27
9	60 45	59 35	24
12	62 25	60 55	21
15	63 25	62 15	18
18	64 45	63 35	15
21	66 25	64 55	12
24	67 20	66 15	9
27	68 40	67 35	6
30	69 55	68 50	3
33	70 10	70 5	0
36	72 20	71 15	27
39	73 30	72 30	24
42	74 40	73 35	21
45	75 45	74 40	18
48	76 45	75 40	15
51	77 45	76 40	12
54	78 40	77 35	9
57	79 30	78 25	6
60	80 15	79 15	3
63	81 0	80 40	0
66	81 40	80 40	27
69	82 15	81 15	24
72	82 45	81 45	21
75	83 15	82 15	18
78	83 45	82 40	15
81	83 55	82 55	12
84	84 25	83 10	9
87	84 20	83 20	6
90	84 29	83 29	3
93	84 29	83 29	0

The Table of the Angle Orient, or Altitude of the Nonagesima Degree, continued.

Afcen.	31	32	Afcen.
0	35 31	34 31	0
3	35 31	34 31	27
6	35 35	34 35	24
9	35 40	34 40	21
12	35 50	34 50	18
15	36 00	35 00	15
18	36 15	35 15	12
21	36 35	35 30	9
24	36 50	35 50	6
27	37 15	36 10	3
0	37 40	36 35	0
3	38 15	37 00	27
6	38 35	37 25	24
9	39 10	38 10	21
12	39 45	38 45	18
15	40 25	39 25	15
18	41 10	40 15	12
21	41 50	40 45	9
24	42 40	41 35	6
27	43 30	42 25	3
0	44 20	43 15	0
3	45 25	44 15	27
6	46 20	45 15	24
9	47 15	46 20	21
12	48 30	47 25	18
15	49 40	48 30	15
18	50 50	49 40	12
21	52 50	50 55	9
24	53 15	52 10	6
27	54 30	53 25	3
0	55 50	54 40	0

The Table of the Angle Orient, or Altitude of the Nonagesime Degree, continued.

Ascen. °	31	32	Ascen. °
0	55 50	54 40	0 VS
3	57 10	56 0	27
6	58 30	57 20	24
9	59 50	58 40	21
12	61 10	60 5	18
15	62 30	61 20	15
18	63 50	62 40	12
21	65 10	64 5	9
24	66 25	65 20	6
27	67 45	66 40	3
0	69 0	67 55	0
3	70 10	69 5	27
6	71 25	70 20	24
9	72 30	71 25	21
12	73 35	72 30	18
15	74 35	73 35	15
18	75 35	74 40	12
21	76 30	75 30	9
24	77 25	76 20	6
27	78 10	77 10	3
0	78 55	77 55	0
3	79 35	78 35	27
6	80 15	79 10	24
9	80 45	79 45	21
12	81 15	80 15	18
15	81 35	80 35	15
18	81 55	80 55	12
21	82 10	81 10	9
24	82 20	81 20	6
27	82 29	81 29	3
0	82 29	81 29	0

The Table of the Angle Orient, or Altitude of the Nonagesime Degree, continued.

Ascen.	33	34	Ascen.
0	33 31	32 31	0
3	33 31	32 31	27
6	33 35	32 35	24
9	33 40	32 40	21
12	33 50	32 50	18
15	34 0	33 0	15
18	34 15	33 15	12
21	34 30	33 31	9
24	34 50	33 50	6
27	35 10	34 10	3
0	35 35	34 35	0
3	36 0	35 0	27
6	36 30	35 30	24
9	37 5	36 0	21
12	37 40	36 35	18
15	38 20	37 15	15
18	39 0	37 55	12
21	39 45	38 40	9
24	40 30	39 25	6
27	41 20	40 15	3
0	42 15	41 10	0
3	43 10	42 5	27
6	44 10	43 5	24
9	45 15	44 5	21
12	46 15	45 10	18
15	47 25	46 15	15
18	48 35	47 25	12
21	49 40	48 35	9
24	51 0	49 50	6
27	52 15	51 5	3
0	53 35	52 25	0

*The Table of the Angle Orient, or Altitude of the Nonagesime
Degree, continued.*

Ascen.	33	34	Ascen.
0	53 35	52 25	0 VS
3	54 30	53 45	27
6	56 10	55 5	24
9	57 35	56 25	21
12	58 55	57 45	18
15	60 15	59 5	15
18	61 35	60 30	12
21	62 55	61 50	9
24	64 15	63 5	6
27	65 30	64 25	3
0	66 50	65 40	0
3	68 0	66 55	27
6	69 15	68 10	24
9	70 25	69 20	21
12	71 30	70 25	18
15	72 30	71 25	15
18	73 30	72 25	12
21	74 25	73 25	9
24	75 20	74 15	6
27	76 10	75 5	3
0	76 55	75 50	0
3	77 35	76 35	27
6	78 10	77 10	24
9	78 45	77 40	21
12	79 10	78 10	18
15	79 35	78 35	15
18	79 55	78 55	12
21	80 10	79 10	9
24	80 20	79 20	6
27	80 29	79 29	3
0	80 29	79 29	0

The Table of the Angle Orient, or Altitude of the Nonagesime
Degree, continued.

Ascen. °	35	36	Ascen. °
0	31 31	30 31	0
3	31 31	30 31	27
6	31 35	30 35	24
9	31 40	30 40	21
12	31 50	30 50	18
15	32 0	31 0	15
18	32 15	31 10	12
21	32 30	31 30	9
24	32 45	31 45	6
27	33 30	32 5	3
0	33 50	32 30	0
3	34 0	32 55	27
6	34 25	33 25	24
9	35 0	33 55	21
12	35 35	34 30	18
15	36 20	35 5	15
18	36 50	35 45	12
21	37 35	36 30	9
24	38 20	37 15	6
27	39 30	38 5	3
0	40 0	38 55	0
3	41 0	39 50	27
6	41 55	40 50	24
9	43 0	41 60	21
12	44 0	42 50	18
15	45 5	44 0	15
18	46 15	45 10	12
21	47 30	46 20	9
24	48 45	47 35	6
27	50 0	48 30	3
0	51 15	49 10	0

The Table of the Angle Orient, or Altitude of the Nonagesime Degree, continu'd.

Ascen.	35	36	Ascen.
0	51 15	50 10	0 vs
3	52 15	51 25	27
6	53 55	52 45	24
9	55 15	54 10	21
12	56 40	55 30	18
15	58 0	56 50	15
18	59 20	58 15	12
21	60 40	59 35	9
24	62 0	60 55	6
27	63 20	62 10	3
0	64 35	63 30	0 ↗
3	65 50	64 45	27
6	67 5	66 0	24
9	68 15	67 10	21
12	69 20	68 15	18
15	70 20	69 20	15
18	71 25	70 20	12
21	72 20	71 20	9
24	73 15	72 10	6
27	74 5	73 0	3
0	74 50	73 45	0 m
3	75 30	74 30	27
6	76 10	75 10	24
9	76 40	75 40	21
12	77 10	76 10	18
15	77 35	76 35	15
18	77 55	76 55	12
21	78 10	77 10	9
24	78 20	77 20	6
27	78 29	77 29	3
0	78 29	77 29	0

The Table of the Angle Orient, or Altitude of the Nonagesime
Degree, continued.

Afcen.	37	38	Afcen.
0			0
3	29 31	28 31	3
6	29 31	28 31	6
9	29 35	28 35	9
12	29 40	28 40	12
15	29 50	28 45	15
18	30 0	29 0	18
21	30 10	29 10	21
24	30 25	29 25	24
27	30 45	29 45	27
30	31 5	30 0	30
33	31 25	30 25	33
36	31 50	30 50	36
39	32 20	31 20	39
42	32 55	31 50	42
45	33 25	32 20	45
48	34 0	32 55	48
51	34 40	33 35	51
54	35 25	34 20	54
57	36 10	35 5	57
60	37 0	35 50	60
63	37 50	36 40	63
66	38 45	37 40	66
69	39 40	38 35	69
72	40 45	39 35	72
75	41 45	40 35	75
78	42 50	41 40	78
81	44 0	42 50	81
84	45 10	44 0	84
87	46 25	45 15	87
90	47 40	46 30	90
93	49 0	47 50	93

The Table of the Angle Orient, or Altitude of the Nonagesime Degree, continued.

Ascen.	37	38	Ascen.
0	49 0	47 50	0 VS
3	50 15	49 10	27
6	51 40	50 30	24
9	53 20	51 50	21
12	54 20	53 10	18
15	55 20	54 35	15
18	57 5	55 55	12
21	58 20	56 20	9
24	59 20	58 40	6
27	61 5	60 0	3
Q 0	62 25	61 15	0
3	63 40	62 30	27
6	64 55	63 45	24
9	66 5	65 0	21
12	67 10	66 5	18
15	68 35	67 10	15
18	69 35	68 10	12
21	70 35	69 10	9
24	71 10	70 5	6
27	72 0	70 55	3
π 0	72 45	71 45	0 M
3	73 30	72 25	17
6	74 5	73 5	24
9	74 40	73 40	21
12	75 10	74 10	18
15	75 55	74 55	15
18	75 55	74 55	12
21	76 10	75 10	9
24	76 20	75 20	6
27	76 29	75 29	3
∞ 0	76 29	75 29	0

The Table of the Angle Orient, or Altitude of the Nonagesima Degree, continued.

Ascen.	39	40	Ascen.
0	27 31	26 31	0
3	27 31	26 31	27
6	27 35	26 35	24
9	27 40	26 40	21
12	27 45	26 45	18
15	28 0	26 55	15
18	28 10	27 10	12
21	28 25	27 25	9
24	28 40	27 40	6
27	29 0	28 0	3
0	29 25	28 20	0
3	29 50	28 45	27
6	30 25	29 15	24
9	30 45	29 40	21
12	31 20	30 15	18
15	31 55	30 55	15
18	32 35	31 30	12
21	33 15	32 10	9
24	33 55	32 50	6
27	34 45	33 40	3
0	35 35	34 30	0
3	36 30	35 25	27
6	37 25	36 20	24
9	38 25	37 20	21
12	39 10	38 20	18
15	40 55	39 25	15
18	41 40	40 30	12
21	42 55	41 45	9
24	44 5	42 55	6
27	45 20	44 10	3
0	46 40	45 30	0

The Table of the Angle Orient, or Altitude of the Nonagesima Degree, continued.

Ascen.	39	40	Ascen.
00	46 40	45 30	00 VS
03	48 20	46 50	27
06	49 40	48 10	24
09	50 40	49 30	21
12	52 25	50 35	18
15	53 25	52 15	15
18	54 45	53 40	12
21	56 10	55 20	09
24	57 30	56 25	06
27	58 50	57 45	03
00	60 10	59 20	00
03	61 25	60 20	27
06	62 40	61 35	24
09	63 55	62 50	21
12	65 10	63 50	18
15	66 25	65 20	15
18	67 40	66 05	12
21	68 10	67 15	09
24	69 05	68 10	06
27	69 55	68 50	03
00	70 40	69 40	00
03	71 25	70 45	27
06	72 45	71 20	24
09	72 35	71 45	21
12	73 05	72 15	18
15	73 35	72 30	15
18	73 55	72 55	12
21	74 10	73 00	09
24	74 20	73 10	06
27	74 29	73 29	03
00	74 29	73 29	00

The Table of the Angle Orient, or Altitude of the Nonagesimi
Degree, continued.

Ascen. °	41 °	42 °	Ascen. °
0	25 31	24 31	0
3	25 31	24 31	27
6	25 35	24 35	24
9	25 40	24 40	21
12	25 45	24 45	18
15	25 55	24 55	15
18	26 10	25 5	12
21	26 25	25 20	9
24	26 40	25 35	6
27	26 55	25 55	3
0	27 20	26 15	0
3	27 45	26 40	27
6	28 10	27 5	24
9	28 40	27 35	21
12	29 10	28 5	18
15	29 45	28 40	15
18	30 20	29 15	12
21	31 0	29 55	9
24	31 45	30 40	6
27	32 10	31 25	3
0	33 20	32 15	0
3	34 15	33 15	27
6	35 10	34 0	24
9	36 10	35 0	21
12	37 10	36 0	18
15	38 15	37 5	15
18	39 20	38 15	12
21	40 35	39 20	9
24	41 45	40 35	6
27	43 0	41 50	3
0	44 20	43 10	0

The Table of the Angle Orient, or Altitude of the Nonagesime Degree, continued.

Ascen.	41	42	Ascen.
	°	°	°
♄ 0	44 20	43 20	0 ♄
3	45 40	44 25	27
6	47 0	45 50	24
9	48 20	47 10	21
12	49 45	48 35	18
15	51 5	49 55	15
18	52 30	51 20	12
21	53 0	52 45	9
24	55 15	54 5	6
27	56 35	55 25	3
♌ 0	57 50	56 50	0 ♌
3	59 10	58 5	27
6	60 30	59 25	24
9	61 40	60 35	21
12	62 50	61 45	18
15	63 55	62 50	15
18	65 0	63 55	12
21	66 0	64 50	9
24	66 55	65 55	6
27	67 50	66 45	3
♍ 0	68 35	67 35	0 ♍
3	69 20	68 20	27
6	70 0	69 0	24
9	70 35	69 35	21
12	71 5	70 5	18
15	71 30	70 30	15
18	71 35	70 55	12
21	72 10	71 10	9
24	72 20	71 20	6
27	72 29	71 29	3
♎ 0	72 29	71 29	0 ♎

The Table of the Angle Orient, or Altitude of the Nonagesime Degree, continued.

Ascen. °	43 °	44 °	Ascen. °
γ 0	23 31	22 31	0 γ
3	23 31	22 31	27
6	23 35	22 35	24
9	23 40	22 40	21
12	23 45	22 45	18
15	23 55	22 55	15
18	24 5	23 5	12
21	24 20	23 20	9
24	24 35	23 35	6
27	24 50	23 50	3
δ 0	25 15	24 10	0 ✕
3	25 40	24 35	27
6	26 5	25 0	24
9	26 50	25 25	21
12	27 0	25 50	18
15	27 35	26 30	15
18	28 10	27 5	12
21	28 50	27 45	9
24	29 30	28 25	6
27	30 20	29 10	3
ε 0	31 5	30 0	0 ~
3	32 0	30 50	27
6	32 55	31 45	24
9	33 50	32 40	21
12	34 50	33 40	18
15	35 50	34 45	15
18	37 0	35 50	12
21	38 10	37 0	9
24	39 25	38 15	6
27	40 40	39 30	3
ζ 0	41 55	40 45	0 vs

The Table of the Angle Oriented or Altitude of the Nonagesime Degree, continued.

Ascen.	43	44	Ascen.
0	41 55	40 45	0 0 VS
3	43 15	42 5	27
6	44 35	43 25	24
9	46 00	44 50	21
12	47 25	46 10	18
15	48 45	47 35	15
18	50 10	49 0	12
21	51 35	50 25	9
24	52 50	51 45	6
27	54 20	53 10	3
0	55 40	54 30	0 0 ♀
3	57 0	55 50	27
6	58 15	57 10	24
9	59 30	58 25	21
12	60 40	59 35	18
15	61 50	60 40	15
18	62 50	61 45	12
21	63 55	62 50	9
24	64 50	63 45	6
27	65 45	64 40	3
0	66 35	65 30	0 0 m
3	67 15	66 15	27
6	67 55	66 55	24
9	68 30	67 30	21
12	69 5	68 5	18
15	69 30	68 30	15
18	69 55	68 50	12
21	70 10	69 10	9
24	70 20	69 20	6
27	70 29	69 29	3
0	70 29	69 29	0 0

The Table of the Angle Orient, or Altitude of the Nonagesime
Degrees, continued.

Ascen. °	45	46	Ascen. °
0	21 31	20 23	0
3	21 31	20 23	27
6	21 35	20 35	24
9	21 40	20 40	21
12	21 45	20 45	18
15	21 50	20 50	15
18	22 5	21 5	12
21	22 20	21 20	9
24	22 30	21 30	6
27	22 50	21 50	3
0	23 10	22 5	0
3	23 30	22 30	27
6	23 55	22 50	24
9	24 25	23 20	21
12	24 55	23 50	18
15	25 25	24 20	15
18	26 0	24 55	12
21	26 35	25 20	9
24	27 20	26 10	6
27	28 0	26 45	3
0	28 50	27 40	0
3	29 40	28 30	27
6	30 25	29 25	24
9	31 30	30 20	21
12	32 30	31 20	18
15	33 35	32 20	15
18	34 40	33 25	12
21	35 45	34 35	9
24	37 0	35 45	6
27	38 15	37 0	3
0	39 30	38 20	0

The Table of the Angle Orient, or Altitude of the Nonagesime
Degrees, continued.

Alt. 0	45	46	Alt. 0
00	39 30	38 20	0 VS
7 3	40 50	39 40	27
4 6	42 10	41 00	24
1 9	43 35	42 20	21
8 12	45 00	43 50	18
5 15	46 25	44 10	15
2 18	47 50	46 35	12
0 21	49 15	48 00	9
0 24	50 35	49 25	6
0 27	52 00	50 50	3
0 0	53 25	52 15	0
7 3	54 45	53 35	27
4 6	56 00	54 55	24
1 9	57 15	56 10	21
8 12	58 30	57 20	18
5 15	59 40	58 30	15
2 18	60 45	59 40	12
0 21	61 45	60 40	9
0 24	62 45	61 40	6
0 27	63 40	62 35	3
0 0	64 30	63 25	0
7 3	65 15	64 10	27
4 6	65 55	64 55	24
1 9	66 30	65 30	21
8 12	67 00	66 00	18
5 15	67 30	66 30	15
2 18	67 50	66 50	12
0 21	68 10	67 10	9
0 24	68 30	67 20	6
0 27	68 49	67 29	3
0 0	68 29	67 29	0

A Table of the Angle Orient, or Altitude of the Nonagesime Degree, continued.

Ascen.	47	48	Ascen.
0	19 31	18 31	0
3	19 31	18 31	27
6	19 35	18 35	24
9	19 40	18 40	21
12	19 45	18 45	18
15	19 50	18 50	15
18	20 0	19 0	12
21	20 15	19 15	9
24	20 30	19 30	6
27	20 45	19 45	3
0	21 5	20 0	0
3	21 25	20 20	27
6	21 50	20 45	24
9	22 15	21 10	21
12	22 45	21 35	18
15	23 15	22 10	15
18	23 45	22 40	12
21	24 25	23 15	9
24	25 0	23 55	6
27	25 45	24 35	3
0	26 10	25 20	0
3	27 20	26 10	27
6	28 15	27 0	24
9	29 30	27 55	21
12	30 55	28 55	18
15	31 10	29 55	15
18	32 15	31 0	12
21	33 20	32 10	9
24	34 35	33 20	6
27	35 50	34 35	3
0	37 5	35 55	0

The Table of the Angle Orient, or Altitude of the Nonagesime Degree, continued.

Ascen.	47	48	Ascen.
0	37 5	35 55	0 vs
3	38 25	37 10	27
6	39 45	38 30	24
9	41 10	39 55	21
12	42 35	41 20	18
15	44 0	42 45	15
18	45 25	44 15	12
21	46 50	45 40	9
24	48 15	47 5	6
27	49 40	48 30	3
0	51 5	49 55	0
3	52 25	51 15	27
6	53 45	52 40	24
9	55 5	53 55	21
12	56 15	55 5	18
15	57 25	56 20	15
18	58 40	57 25	12
21	59 25	58 10	9
24	60 35	59 35	6
27	61 30	60 30	3
0	62 20	61 20	0 m
3	63 10	62 5	27
6	63 50	62 50	24
9	64 30	63 25	21
12	65 0	64 0	18
15	65 30	64 25	15
18	65 50	64 50	12
21	66 10	65 10	9
24	66 20	65 20	6
27	66 25	65 25	3
0	66 25	65 25	0

The Table of the Angle Orient, or Altitude of the Nonagefine Degree, continued.

Alcen.	49	50	Afen.
0			0
3	17 31	16 31	27
6	17 34	16 34	24
9	17 35	16 35	21
12	17 40	16 40	18
15	17 45	16 45	15
18	17 50	16 50	12
21	18 0	17 0	9
24	18 10	17 10	6
27	18 25	17 25	3
30	18 40	17 40	0
33	19 0	18 0	27
36	19 20	18 15	24
39	19 40	18 35	21
42	20 5	19 0	18
45	20 50	19 25	15
48	21 0	19 50	12
51	21 30	20 25	9
54	22 5	21 0	6
57	22 45	21 35	3
60	23 25	22 15	0
63	24 10	23 0	27
66	25 0	23 45	24
69	25 50	24 35	21
72	26 45	25 30	18
75	27 45	26 25	15
78	28 40	27 25	12
81	29 45	28 30	9
84	30 55	29 35	6
87	32 5	30 50	3
90	33 20	32 5	0
93	34 35	33 20	27

The Table of the Angle Orient, or Altitude of the Nona-time
Degree, continued

Afcen.	49	50	Afcen.
0	0	0	0
3	34 39	33 20	0 VS
6	35 55	34 40	27
9	37 15	36 0	24
12	38 40	37 25	21
15	40 10	38 50	18
18	41 35	40 20	15
21	43 0	41 45	12
24	44 25	43 15	9
27	45 55	44 20	6
30	47 20	46 5	3
33	48 45	47 35	0
36	50 10	48 55	27
39	51 30	50 20	24
42	52 45	51 40	21
45	54 0	52 55	18
48	55 10	54 5	15
51	56 20	55 15	12
54	57 25	56 20	9
57	58 30	57 25	6
60	59 25	58 20	3
63	60 15	59 15	0
66	61 5	60 0	27
69	61 45	60 45	24
72	62 25	61 25	21
75	63 0	61 55	18
78	63 25	62 25	15
81	63 55	62 50	12
84	64 10	63 10	9
87	64 20	63 20	6
90	64 29	63 29	3
	64 29	63 29	0

The Table of the Angle Orient, or Altitude of the Nonagesime Degree, continued.

Ascen. 0	51	52	Ascen. 0
0	15 31	14 31	0
3	15 31	14 31	27
6	15 35	14 31	24
9	15 40	14 35	21
12	15 45	14 40	18
15	15 50	14 45	15
18	16 0	14 55	12
21	16 10	15 10	9
24	16 20	15 20	6
27	16 35	15 30	3
0	16 50	15 50	0
3	17 15	16 10	27
6	17 10	16 25	24
9	17 55	16 50	21
12	18 20	17 15	18
15	18 45	17 40	15
18	19 15	18 10	12
21	19 50	18 40	9
24	20 25	19 15	6
27	21 5	19 55	3
0	21 50	20 35	0
3	22 35	21 20	27
6	23 25	22 10	24
9	24 15	23 0	21
12	25 10	23 55	18
15	26 10	24 55	15
18	27 15	25 55	12
21	28 20	27 5	9
24	29 30	28 15	6
27	30 45	29 30	3
0	32 5	30 45	0

*The Table of 100 Angle Orient, or Altitud. of the Nopagesim.
Degree, continued.*

Ascen.	51	52	Ascen.
0	32 5	30 45	0 vs
3	33 20	32 5	27
6	34 45	33 25	24
9	36 10	34 50	21
12	37 35	36 20	18
15	39 5	37 45	15
18	40 30	39 15	12
21	42 0	40 45	9
24	43 25	42 15	6
27	44 50	43 40	3
0	46 20	45 10	0 7
3	47 45	46 35	27
6	49 10	48 0	24
9	50 10	49 20	21
12	51 45	50 35	18
15	53 0	51 50	15
18	54 10	53 5	12
21	55 15	54 10	9
24	56 20	55 15	6
27	57 15	56 15	3
0	58 10	57 5	0 m
3	59 0	57 55	27
6	59 45	58 40	24
9	60 20	59 20	21
12	60 55	59 55	18
15	61 25	60 25	15
18	62 50	60 50	12
21	62 10	61 5	9
24	62 20	61 20	6
27	62 29	61 29	3
0	62 29	61 29	0

The Table of the Angle Orient, or Altitude of the Nonagesimo Degree, continued.

Ascen.	53	54	Ascen.
0			0
γ 0	13 31	12 31	0 γ
3	13 31	12 31	27
6	13 31	12 31	24
9	13 35	12 35	21
12	13 40	12 40	18
15	13 55	12 45	15
18	13 55	12 55	12
21	14 5	13 5	9
24	14 15	13 15	6
27	14 30	13 30	3
δ 0	14 45	13 40	0 ✕
3	15 5	14 0	27
6	15 20	14 15	24
9	15 45	14 35	21
12	16 10	15 0	18
15	16 35	15 25	15
18	17 0	15 50	12
21	17 30	16 20	9
24	18 5	16 55	6
27	18 45	17 30	3
II 0	19 25	18 10	0 ≈
3	20 5	18 55	27
6	20 50	19 40	24
9	21 45	20 30	21
12	22 40	21 20	18
15	23 35	22 20	15
18	24 40	23 20	12
21	25 45	24 25	9
24	26 55	25 35	6
27	28 10	26 50	3
♄ 0	29 25	28 5	0 ♄

The Table of the Angle Orient, or Altitude of the Nonagesime Degree, continu'd.

Afcen.	53	54	Afcen.
0	0	0	0
3	29 25	28 5	27
6	30 45	29 25	24
9	32 10	30 45	21
12	33 35	32 10	18
15	35 0	33 40	15
18	36 30	35 10	12
21	38 0	36 40	9
24	39 30	38 10	6
27	41 0	39 40	3
30	42 25	41 15	0
33	43 55	42 45	27
36	45 25	44 10	24
39	46 50	45 35	21
42	48 10	47 0	18
45	49 30	48 20	15
48	50 45	49 35	12
51	52 0	50 50	9
54	53 5	52 0	6
57	54 10	53 5	3
60	55 10	54 5	0
63	56 4	55 0	27
66	56 55	55 50	24
69	57 40	56 35	21
72	58 20	57 15	18
75	58 55	57 55	15
78	59 25	58 20	12
81	59 50	58 45	9
84	60 5	59 5	6
87	60 20	59 20	3
90	60 29	59 29	0

The Table of the Angle Orient, or Altitude of the Nonagesima Degree, continued.

Ascen. °	55	56	Ascen. °
γ 0	11 31	10 31	0 γ
3	11 31	10 31	27
6	11 31	10 31	24
9	11 35	10 35	21
12	11 40	10 40	18
15	11 45	10 45	15
18	11 55	10 50	12
21	12 0	11 0	9
24	12 10	11 10	6
27	12 25	11 20	3
δ 0	12 40	11 35	0 $\times$
3	12 55	11 50	27
6	13 10	12 5	24
9	13 30	12 20	21
12	13 50	12 40	18
15	14 15	13 5	15
18	14 40	13 30	12
21	15 10	14 0	9
24	15 40	14 30	6
27	16 20	15 5	3
Π 0	16 55	15 40	0 $\sim$
3	16 35	16 20	27
6	18 20	17 5	24
9	19 10	17 50	21
12	20 0	18 40	18
15	21 0	19 35	15
18	21 55	20 35	12
21	23 10	21 40	9
24	24 10	22 50	6
27	25 25	24 5	3
Θ 0	26 40	25 15	0 $\vee$

The Table of the Angle Orient, or Altitude of the Nonagesima Degree, continued.

Afcen.	55	56	Afcen.
0	26 40	25 15	0 VS
3	28 0	26 40	27
6	29 25	28 5	24
9	30 50	29 30	21
12	32 15	30 55	18
15	33 50	32 30	15
18	35 20	34 0	12
21	36 50	35 35	9
24	38 25	37 5	6
27	40 0	38 40	3
0	41 30	40 15	0 ♄
3	42 54	41 40	27
6	44 25	43 10	24
9	45 55	44 35	21
12	47 30	46 0	18
15	48 25	47 20	15
18	49 40	48 35	12
21	50 55	49 40	9
24	52 0	50 50	6
27	53 0	51 55	3
0	53 55	52 50	0 ♀
3	54 45	53 45	27
6	55 35	54 30	24
9	56 15	55 15	21
12	56 55	55 50	18
15	57 20	56 20	15
18	57 45	56 45	12
21	58 5	57 5	9
24	58 20	57 20	6
27	58 29	57 29	3
0	58 29	57 29	0 ♀

The Table of the Angle Orient, or Altitude of the Nonagesime Degree, continued.

Ascen.	57	58	Ascen.
0	0	0	0
3	9 31	8 31	0 γ
6	9 31	8 31	27
9	9 31	8 31	24
12	9 35	8 35	21
15	9 40	8 40	18
18	9 45	8 45	15
21	9 50	8 50	12
24	9 55	8 55	9
27	10 5	9 5	6
0	10 15	9 15	3
3	10 30	9 25	0 ☿
6	10 45	9 40	27
9	11 0	9 50	24
12	11 15	10 5	21
15	11 35	10 25	18
18	11 55	10 45	15
21	12 20	11 5	12
24	12 50	11 35	9
27	13 15	12 0	6
0	13 50	12 30	3
3	14 20	13 5	0 ♀
6	15 0	13 40	27
9	15 45	14 20	24
12	16 30	15 5	21
15	17 20	15 20	18
18	18 15	16 45	15
21	19 10	17 45	12
24	20 15	18 45	9
27	21 25	19 55	6
0	22 35	21 5	3
3	23 50	22 20	0 ♄

The Table of the Angle Orient, or Altitude of the Nonagesime Degree, continued.

Ascen. °	57	58	Ascen. °
0	23 50	22 20	0 VS
3	25 10	23 40	27
6	26 35	25 5	24
9	28 0	26 35	21
12	29 10	28 5	18
15	31 5	29 35	15
18	32 35	31 10	12
21	34 10	32 50	9
24	35 45	34 25	6
27	37 25	36 0	3
0	38 55	37 40	0
3	40 30	39 10	27
6	41 55	40 40	24
9	43 25	42 10	21
12	44 50	43 35	18
15	46 10	44 50	15
18	47 25	46 15	12
21	48 40	47 30	9
24	49 45	48 40	6
27	50 55	49 45	3
0	51 50	50 45	0
3	52 40	51 35	27
6	53 30	52 25	24
9	54 10	53 10	21
12	54 50	53 45	18
15	55 20	54 15	15
18	55 45	54 45	12
21	56 5	55 5	9
24	56 20	55 20	6
27	56 29	55 29	3
0	56 29	55 29	0

The Table of the Angle Orient, or Altitude of the Nonagesimal Degree, continued.

Afcen. °	59	60	Afcen. °
<u>γ</u> 0	7 31	6 31	0 γ
3	7 31	6 31	27
6	7 21	6 31	24
9	7 35	6 35	21
12	7 40	6 40	18
15	7 45	6 45	15
<u>18</u>	7 50	6 45	<u>12</u>
21	7 55	6 50	9
24	8 0	7 0	6
27	8 10	7 5	3
<u>δ</u> 0	8 23	7 15	0 ✕
3	8 35	7 25	27
6	8 45	7 35	24
9	9 0	7 50	21
12	9 15	8 5	18
15	9 30	8 25	15
18	9 55	8 40	12
21	10 20	9 10	9
<u>24</u>	10 55	9 25	<u>6</u>
27	11 35	9 55	3
<u>η</u> 0	11 10	10 20	0 ~
3	12 55	10 55	27
6	13 45	11 35	24
9	13 40	12 10	21
<u>12</u>	14 25	12 55	<u>18</u>
15	15 20	13 45	15
18	16 15	14 40	12
21	17 15	15 40	9
24	18 20	16 45	6
27	19 30	17 55	3
<u>θ</u> 0	20 45	19 10	0 vs

The Table of the Angle Orient, or Altitude of the Nonagesime Degree, continued.

Ascen.	59	60	Ascen.
0	0	0	0
3	20 45	19 10	3
6	22 10	20 35	6
9	23 0	22 0	9
12	25 35	23 35	12
15	26 35	25 0	15
18	28 10	26 40	18
21	29 45	28 15	21
24	31 25	29 55	24
27	33 0	31 35	27
0	34 40	33 15	0
3	36 20	34 55	3
6	37 50	36 30	6
9	39 25	38 5	9
12	40 50	39 40	12
15	42 25	41 10	15
18	43 45	42 35	18
21	45 10	43 55	21
24	46 20	45 15	24
27	47 30	46 25	27
0	48 35	47 30	0
3	49 40	48 35	3
6	50 50	49 50	6
9	51 25	50 20	9
12	52 5	51 5	12
15	52 45	51 40	15
18	53 15	52 15	18
21	53 45	52 45	21
24	54 5	53 5	24
27	54 20	53 20	27
0	54 29	53 29	0

A Table of the Angle Orient, or Altitude of the Nonagesime Degree, continued.

Ascen.	61	62	Ascen.
<u>0</u>	<u>5 31</u>	<u>4 31</u>	<u>0</u> Υ
3	5 31	4 31	27
6	5 31	4 31	24
9	5 31	4 31	21
12	5 35	4 35	18
15	5 40	4 40	15
<u>18</u>	<u>5 40</u>	<u>4 40</u>	<u>12</u>
21	5 45	4 45	9
24	5 55	4 50	6
27	6 0	4 55	3
$\oslash$ 0	6 10	5 5	0 $\times$
3	6 20	5 10	27
<u>6</u>	<u>6 30</u>	<u>5 20</u>	<u>24</u>
9	6 45	5 30	21
12	6 50	5 40	18
15	7 10	5 55	15
18	7 25	6 10	12
21	7 45	6 25	9
<u>24</u>	<u>8 10</u>	<u>6 45</u>	<u>6</u>
27	8 30	7 10	3
Π 0	9 0	7 30	0 $\equiv$
3	9 30	8 0	27
6	10 5	8 30	24
9	10 40	9 5	21
<u>12</u>	<u>11 20</u>	<u>9 40</u>	<u>18</u>
15	12 10	10 25	15
18	13 0	11 15	12
21	14 0	12 15	9
24	15 5	13 15	6
27	16 15	14 25	3
$\ominus$ 0	17 25	15 35	0 $\vee$

The Table of the Angle Orient; or Altitude of the Nonagesime Degree, continued.

Ascen.	61	62	Ascen.
0	17 25	15 35	0 VS
3	18 50	17 0	27
6	20 15	18 25	24
9	21 45	20 0	21
12	23 20	21 40	18
15	25 0	23 20	15
18	26 40	25 5	12
21	28 20	26 45	9
24	30 5	28 10	6
27	31 50	30 20	3
0	33 30	32 5	0
3	35 15	33 50	27
6	36 50	35 30	24
9	38 25	37 5	21
12	40 55	38 40	18
15	41 25	40 10	15
18	42 45	41 35	12
21	44 5	42 50	9
24	45 20	44 5	6
27	46 25	45 15	3
0	47 25	46 20	0
3	48 20	47 0	27
6	49 20	48 10	24
9	50 0	49 0	21
12	51 40	49 40	18
15	51 15	50 15	15
18	51 40	50 40	12
21	52 0	51 0	9
24	52 15	51 15	6
27	52 25	51 25	3
0	52 29	51 29	0

The Table of the Angle Orient, or Altitude of the Nonagesima Degree, continued.

Ascen. 0	63	64	Ascen. 0
<u>0</u>	<u>3 31</u>	<u>2 31</u>	<u>0</u> γ
3	3 31	2 31	27
6	3 31	2 31	24
9	3 31	2 31	21
12	3 35	2 31	18
15	3 35	2 35	15
<u>18</u>	<u>3 35</u>	<u>2 35</u>	<u>12</u>
21	3 40	2 35	9
24	3 45	2 40	6
27	3 50	2 45	3
δ 0	3 55	2 50	0 $\times$
3	4 0	2 55	27
<u>6</u>	<u>4 10</u>	<u>3 0</u>	<u>24</u>
9	4 15	3 5	21
12	4 25	3 15	18
15	4 40	3 20	15
18	4 50	3 30	12
21	5 5	3 45	9
<u>24</u>	<u>5 25</u>	<u>3 55</u>	<u>6</u>
27	5 40	4 10	3
Π 0	6 0	4 25	0 $\sim$
3	6 25	4 45	27
6	6 55	5 10	24
9	7 20	5 35	21
<u>12</u>	<u>8 0</u>	<u>6 5</u>	<u>18</u>
15	8 40	6 45	15
18	9 25	7 20	12
21	10 15	8 10	9
24	11 15	9 5	6
27	12 25	10 10	3
ϕ 0	13 40	11 25	0 $\vee$

The Table of the Angle Orient, or Altitude of the Nonagesime Degree, continued.

Ascen. °	63	64	Ascen. °
0	13 40	11 25	0 vs
3	15 0	12 45	27
6	16 30	14 15	24
9	18 5	15 55	21
12	19 45	17 40	18
15	21 30	19 30	15
18	23 15	21 25	12
21	25 5	23 15	9
24	26 55	25 30	6
27	28 45	27 5	3
0	30 35	29 0	0
3	32 20	30 50	27
6	34 5	32 40	24
9	35 45	34 20	21
12	37 20	36 0	18
15	38 50	37 35	15
18	40 15	39 5	12
21	41 40	40 30	9
24	42 50	41 45	6
27	44 10	43 0	3
0	45 15	44 5	0
3	46 15	45 5	27
6	47 5	46 0	24
9	47 55	46 50	21
12	48 35	47 35	18
15	49 10	48 10	15
18	49 40	48 40	12
21	50 0	49 0	9
24	50 15	49 15	6
27	50 25	49 25	3
0	50 29	49 29	0

The Table of the Angle Orient, or Altitude of the Nonagesima Degree, continued.

Ascen.	65	66	Ascen.
0	1 31	0 31	0
3	1 31	0 31	27
6	1 31	0 31	24
9	1 31	0 31	21
12	1 31	0 31	18
15	1 31	0 31	15
18	1 35	0 31	12
21	1 35	0 31	9
24	1 35	0 31	6
27	1 40	0 31	3
0	1 40	0 35	0
3	1 45	0 35	27
6	1 45	0 35	24
9	1 50	0 35	21
12	1 55	0 40	18
15	2 0	0 40	15
18	2 10	0 40	12
21	2 15	0 45	9
24	2 25	0 45	6
27	2 35	0 50	3
0	2 45	0 55	0
3	3 0	1 0	27
6	3 15	1 10	24
9	3 30	1 15	21
12	3 55	1 20	18
15	4 20	1 40	15
18	4 55	1 55	12
21	5 40	2 20	9
24	6 35	2 55	6
27	7 35	3 45	3
0	8 40	4 50	0

The Table of the Angle Orient, or Altitude of the Nonagesime Degree, continued.

Afcen.	65	66	Afcen.
0	8 40	4 50	0 VS
3	10 0	6 20	27
6	11 35	8 10	24
9	13 25	10 5	21
12	15 20	12 20	18
15	17 15	14 30	15
18	19 15	16 45	12
21	21 15	19 0	9
24	23 15	21 10	6
27	25 15	23 20	3
0	27 20	25 30	0 ↗
3	29 15	27 35	27
6	31 10	29 35	24
9	32 55	31 25	21
12	34 35	33 15	18
15	36 15	34 55	15
18	37 45	36 30	12
21	39 15	38 0	9
24	40 40	40 20	6
27	41 55	40 40	3
0	44 0	41 50	0 m
3	44 0	42 55	27
6	45 55	43 55	24
9	45 50	44 45	21
12	46 35	45 25	18
15	47 10	46 5	15
18	47 40	46 35	12
21	48 0	47 0	9
24	48 15	47 15	6
27	48 25	47 25	3
0	48 29	47 29	0

The Table of the Angle Orient, or Altitude of the Nonagesime Degree, continued.

Ascen. °	66° 31'	67°	Ascen. °
<u>0</u>	The Nonagesime Degree leaps in a Moment from the End of Virgo in the West, to the Beginning of Aries in the East.	<u>0</u> 29	<u>0</u> γ
3		0 29	27
6		0 31	24
9		0 31	21
12		0 31	18
15		0 31	15
<u>18</u>		<u>0</u> 31	<u>12</u>
21		0 31	9
24		0 31	6
27		0 31	3
<u>0</u>		<u>0</u> 35	<u>0</u> ✕
3		0 35	27
6		0 35	24
9		0 35	21
12		0 40	18
15		0 40	15
18		0 40	12
21		0 45	9
<u>24</u>		<u>0</u> 45	<u>6</u>
27		0 50	3
<u>0</u>		<u>0</u> 55	<u>0</u> ≈
3		1 0	27
6		1 10	24
9		1 15	21
<u>12</u>		<u>1</u> 20	<u>18</u>
15		1 40	15
18		1 55	12
21		2 20	9
24		3 55	6
27		3 45	3
<u>0</u>		<u>4</u> 50	<u>0</u> vs

The Table of the Angle Orient, or Altitude of the Nonagesime Degree, continued.

Ascen. °	66 31'	67	Ascen. °
<u>0</u>	<u>0</u>	<u>0</u>	<u>0</u> ^{VS}
3	2 35		27
6	5 10		24
9	7 45	3 5	21
12	10 20	6 0	18
<u>15</u>	<u>12 50</u>	<u>10 20</u>	<u>15</u>
18	15 20	13 25	12
21	17 45	16 5	9
24	19 5	18 40	6
27	22 20	21 5	3
<u>0</u> ^Q	<u>24 35</u>	<u>23 30</u>	<u>0</u> ^Q
3	26 45	25 45	27
6	28 45	27 50	24
9	30 40	29 50	21
12	32 30	31 40	18
15	34 10	32 25	15
18	35 50	35 5	12
<u>21</u>	<u>37 25</u>	<u>36 45</u>	<u>9</u>
24	38 45	38 15	6
27	40 5	39 15	3
<u>0</u> ^Q	<u>41 20</u>	<u>40 40</u>	<u>0</u> ^Q
3	42 25	41 45	27
6	43 20	42 45	24
<u>9</u>	<u>44 15</u>	<u>43 40</u>	<u>21</u>
12	45 0	44 30	18
15	45 40	45 5	15
18	46 10	45 35	12
21	46 30	46 0	9
24	46 45	46 15	6
27	46 55	46 25	3
<u>0</u> ^Q	<u>46 58</u>	<u>46 29</u>	<u>0</u> ^Q

The Table of the Angle Orient, or Altitude of the Nonagesima Degree, continued.

Afcen.	68	69	Afcen.
0	0	0	0
3	1 29	2 29	0 γ
6	1 31	2 31	27
9	1 31	2 31	24
12	1 35	2 35	21
15	1 35	2 35	18
18	1 35	2 35	15
21	1 35	2 40	12
24	1 40	2 45	9
27	1 40	2 50	6
0	1 45	2 55	3
3	1 45	3 0	0 ✕
6	1 50	3 5	27
9	1 55	3 15	24
12	2 0	3 25	21
15	2 10	3 35	18
18	2 15	3 45	15
21	2 25	4 5	12
24	2 30	4 25	9
27	2 45	4 50	6
0	3 0	5 25	3
3	3 25	6 30	0 ~
6	3 55	8 30	27
9	4 45	10 50	24
12	6 35		21
15	8 45		18
18			15
21			12
24			9
27			6
0			3
			0

The Table of the Angle Orient, or Altitude of the Nonagesime Degree, continued.

Ascen.	68	69	Ascen.
0			0
3			27
6			24
9			21
12			18
15			15
18	8 45		12
21	11 10		9
24	15 20	10 50	6
27	18 25	13 55	3
0	21 10	18 5	0
3	23 45	21 20	27
6	26 5	24 0	24
9	28 10	26 15	21
12	30 0	28 20	18
15	31 50	30 20	15
18	33 40	32 15	12
21	35 25	34 0	9
24	36 55	35 40	6
27	38 20	36 5	3
0	39 30	38 20	0
3	40 35	39 25	27
6	41 35	40 30	24
9	42 35	41 25	21
12	43 25	42 20	18
15	44 5	43 3	15
18	44 35	43 35	12
21	44 55	43 55	9
24	45 10	44 10	6
27	45 25	44 25	3
0	45 29	44 29	0

The Table of the Angle Orient, or Altitude of the Nonagesima Degree, continued.

Ascen.	70	71	Ascen.
0	0	0	0
3	3 29	4 29	3
6	3 35	4 35	6
9	3 35	4 35	9
12	3 35	4 35	12
15	3 40	4 45	15
18	3 45	4 50	18
21	3 50	4 55	21
24	3 55	5 5	24
27	4 0	5 25	27
0	4 10	5 35	0
3	5 20	5 40	3
6	5 35	6 0	6
9	6 0	6 20	9
12	6 35	6 45	12
15	7 30	7 25	15
18	9 0	8 10	18
21	12 40	9 20	21
24		11 0	24
27		14 10	27
0			0
3			3
6			6
9			9
12			12
15			15
18			18
21			21
24			24
27			27
0			0

The Table of the Angle Orient, or Altitude of the Nonagesime Degree, continu'd.

Ascen. °	70	71	Ascen. °
0			0 VS
3			27
6			24
9			21
12			18
15			15
18			12
21			9
24			6
27			3
00	12 40		0 ↗
3	17 40	14 10	27
6	21 10	16 55	24
9	24 5	21 20	21
12	26 25	24 35	18
15	28 35	26 35	15
18	30 40	29 5	12
21	32 35	31 0	9
24	34 20	32 40	6
27	35 55	34 25	3
00	37 10	35 50	0 m
3	38 15	37 5	27
6	39 25	38 15	24
9	40 25	39 15	21
12	41 15	40 10	18
15	42 0	40 55	15
18	42 35	41 30	12
21	42 45	41 55	9
24	43 15	42 15	6
27	43 25	42 25	3
00	43 29	42 29	0 m

The Table of the Angle Orient, or Altitude of the Nonagesima Degree, continued.

Ascen. °	72	73	Ascen. °
0	5 29	6 29	0 0
3	5 29	6 29	27
6	5 35	6 35	24
9	5 35	6 40	21
12	5 35	6 45	18
15	5 40	6 50	15
18	5 55	7 0	12
21	6 5	7 10	9
24	6 15	7 25	6
27	6 25	7 45	3
0 0	6 45	8 5	0 0
3	7 5	8 30	27
6	7 30	9 5	24
9	8 0	9 50	21
12	8 40	10 50	18
15	9 35	12 35	15
18	11 0	16 30	12
21	15 45		9
24			6
27			3
0 0			0 0
3			27
6			24
9			21
12			18
15			15
18			12
21			9
24			6
27			3
0 0			0 0

The Table of the Angle Orient, or Altitude of the Nonagesime Degree, continued.

Ascen.	72	73	Ascen.
0			0
3			27
6			24
9			21
12			18
15			15
18			12
21			9
24			6
27			3
0			0
3			27
6			24
9	15 45		21
12	21 25	16 30	18
15	24 40	21 40	15
18	27 15	25 0	12
21	29 20	27 45	9
24	31 15	29 45	6
27	33 0	31 35	3
0	34 35	33 15	0
3	35 55	34 40	27
6	37 10	35 55	24
9	38 10	37 5	21
12	39 5	38 0	18
15	39 50	38 45	15
18	40 25	39 25	12
21	40 50	39 50	9
24	41 15	40 15	6
27	41 25	40 29	3
0	41 29	40 29	0

The Table of the Angle Orient, or Altitude of the Nonagesime Degree, continued.

Ascen.		74		75		Ascen.
°		°	'	°	'	°
γ 0		7	29	8	29	0 γ
3		7	29	8	29	27
6		7	35	8	35	24
9		7	40	8	40	21
12		7	45	8	50	18
15		7	50	9	0	15
18		8	5	9	15	12
21		8	20	9	35	9
24		8	40	9	55	6
27		9	5	10	20	3
δ 0		9	30	11	0	0 δ
3		10	0	11	40	27
6		10	50	12	55	24
9		12	0	15	0	21
12		13	50	18	10	18
15		17	30			15
18						12
21						9
24						6
27						3
Π 0						0 Π
3						27
6						24
9						21
12						18
15						15
18						12
21						9
24						6
27						3
Θ 0						0 Θ

The Table of the Angle Orient, or Altitude of the Nonagesime Degree, continued.

Afcen.	74,	75,	Afcen.
0			0
3			27
6			24
9			21
12			18
15			15
18			12
21			9
24			6
27			3
0			0
3			27
6			24
9			21
12			18
15	17 30		15
18	22 0	18 10	12
21	25 25	22 25	9
24	28 0	25 50	6
27	30 5	28 20	3
0	31 50	30 20	0
3	33 20	32 0	27
6	34 40	33 30	24
9	35 50	34 40	21
12	36 50	35 45	18
15	37 40	36 35	15
18	38 20	37 20	12
21	38 50	37 50	9
24	39 15	38 15	6
27	39 29	38 29	3
0	39 29	38 29	0

A Table of the Angle Orient, or Altitude of the Nonagesime Degree, continued.

Ascen.	76	77	Ascen.
0	9 29	10 29	0
3	9 29	10 29	27
6	9 35	10 35	24
9	9 40	10 45	21
12	9 55	11 0	18
15	10 10	11 15	15
18	10 25	11 35	12
21	10 45	12 0	9
24	11 10	12 35	6
27	11 45	13 30	3
0	12 40	14 35	0
3	13 55	16 40	27
6	15 55	19 45	24
9	19 5		21
12			18
15		02 11	15
18	01 21	0 22	12
21	22 40	22 22	9
24	02 22	0 22	6
27	02 22	2 02	3
0	02 02	02 12	0
3	0 22	02 22	27
6	02 22	04 22	24
9	04 22	07 22	21
12	24 22	07 22	18
15	22 22	04 22	15
18	02 22	02 22	12
21	02 22	02 22	9
24	21 22	21 22	6
27	22 22	22 22	3
0	22 22	22 22	0

The Table of the Angle Orient, or Altitude of the Nonagesime Degree, continued.

Ascen. °	76 °	77 °	Ascen. °
0	02 21	04 11	0 VS
3	02 21	04 11	27
6	04 21	06 11	24
9	06 21	08 11	21
12	08 21	10 11	18
15	10 21	12 11	15
18	12 41	14 21	12
21	14 41	16 21	9
24	16 21	18 21	6
27	18 01	20 41	3
0	20 02	22 11	0
3		24 02	27
6			24
9			21
12			18
15			15
18			12
21	19 5		9
24	22 55	19 45	6
27	26 20	23 30	3
0	28 40	26 45	0
3	30 40	28 55	27
6	32 15	30 45	24
9	33 30	32 15	21
12	34 35	33 25	18
15	35 25	34 20	15
18	36 15	35 10	12
21	36 45	35 45	9
24	37 15	36 10	6
27	37 29	36 29	3
0	37 29	36 29	0

The Table of the Angle Orient, or Altitude of the Nonagesima Degree, continued.

Ascen.	78	79	Ascen.
0	0	0	0
3	11 29	12 29	3
6	11 29	12 33	6
9	11 40	12 40	9
12	11 45	12 50	12
15	12 5	13 10	15
18	12 30	13 35	18
21	12 50	14 5	21
24	13 20	14 45	24
27	14 10	15 50	27
0	14 15	17 40	0
3	17 15	20 55	3
6	20 25		6
9			9
12			12
15			15
18			18
21			21
24			24
27			27
0			0
3			3
6			6
9			9
12			12
15			15
18			18
21			21
24			24
27			27
0			0

The Table of the Angle Orient, or Altitude of the Nonagesimal Degree, continued.

Ascen.	78	79	Ascen.
0	0	0	0
0			0 VS
3			27
6			24
9			21
12			18
15			15
18			12
21			9
24			6
27			3
0			0
3			27
6			24
9			21
12			18
15			15
18			12
21			9
24			6
27	22 25		3
0	24 5	20 55	0
3	27 10	24 45	27
6	29 15	27 30	24
9	30 45	29 30	21
12	32 5	30 50	18
15	33 10	32 0	15
18	34 5	33 0	12
21	34 43	33 40	9
24	35 10	34 10	6
27	35 29	34 29	3
0	35 29	34 29	0

The Table of the Angle Orient, or Altitude of the Nonagesime Degree, continued.

Ascen. °	80 °	81 °	Ascen. °
0	13 29	14 29	0
3	13 34	14 35	27
6	13 40	14 45	24
9	13 35	15 0	21
12	14 15	15 25	18
15	14 45	16 0	15
18	15 25	16 55	12
21	16 25	18 25	9
24	18 5	21 50	6
27	21 25		3
0			0
3			27
6			24
9			21
12			18
15			15
18			12
21			9
24			6
27			3
0			0
3			27
6			24
9			21
12			18
15			15
18			12
21			9
24			6
27			3
0			0

The Table of the Angle Orient, or Altitude of the Nonagesime Degree, continued.

Ascen.	80	81	Ascen.
0			0
3			27
6			24
9			21
12			18
15			15
18			12
21			9
24			6
27			3
0			0
3			27
6			24
9			21
12			18
15			15
18			12
21			9
24			6
27			3
0			0
3	21 25	21 50	27
6	25 15	25 49	24
9	27 50	28 0	21
12	29 35	29 0	18
15	30 55	30 0	15
18	31 50	31 0	12
21	32 35	32 0	9
24	33 5	32 0	6
27	33 25	32 0	3
0	33 29	32 29	0

The Table of the Angle Orient, or Altitude of the Nonagesime Degree, continued.

Ascen.	82,	82,	Ascen.
0	15 29	16 29	0
3	15 35	16 35	27
6	15 45	16 50	24
9	16 5	17 15	21
12	16 40	17 55	18
15	17 25	19 5	15
18	18 50	22 30	12
21	22 10		9
24			6
27			3
0			0
3			
6			
9			
12			
15			
18			
21			
24			
27			
0			
3			
6			
9			
12			
15			
18			
21			
24			
27			
0			
3			
6			
9			
12			
15			
18			
21			
24			
27			
0			

The Table of the Angle Orient, or Altitude of the Nonagesime Degree, continued.

Afcen.	84	85	Afcen.
0	0	0	0
1	17 29	18 29	1
2	17 35	18 40	2
3	17 55	19 0	3
4	18 25	19 45	4
5	19 25	21 35	5
6	21 55	23 0	6
7	22 45		7
8			8
9			9
10			10
11			11
12			12
13			13
14			14
15			15
16			16
17			17
18			18
19			19
20			20
21			21
22			22
23			23
24			24
25			25
26			26
27			27
28			28
29			29

The Table of the Angle Orient, or Altitude of the Nonagesime Degree, continued.

Afcen.	86	87	Afcen.
0	0	0	0
1	19 29	20 29	1
2	19 40	20 45	2
3	20 10	21 35	3
4	21 30	23 10	4
5	23 10		5
6			6
7			7
8			8
9			9
10			10
11			11
12			12
13			13
14			14
15			15
16			16
17			17
18			18
19			19
20			20
21			21
22			22
23			23
24			24
25			25
26			26
27			27
28			28
29			29
30			30
31			31
32			32
33			33
34			34
35			35
36			36
37			37
38			38
39			39
40			40
41			41
42			42
43			43
44			44
45			45
46			46
47			47
48			48
49			49
50			50
51			51
52			52
53			53
54			54
55			55
56			56
57			57
58			58
59			59
60			60
61			61
62			62
63			63
64			64
65			65
66			66
67			67
68			68
69			69
70			70
71			71
72			72
73			73
74			74
75			75
76			76
77			77
78			78
79			79
80			80
81			81
82			82
83			83
84			84
85			85
86			86
87			87
88			88
89			89
90			90
91			91
92			92
93			93
94			94
95			95
96			96
97			97
98			98
99			99
100			100

The Table of the Angle Orient, or Altitude of the Nonagesima Degree, continued.

Ascen.	88	89	90	Ascen.
0	0	0	0	0
3	21 29	22 29	23 29	27
6	21 50	23 29		24
9	23 25			21
12				18
15				15
18				12
21				9
24				6
27				3
0				0
3				
6				
9				
12				
15				
18				
21				
24				
27				
0				
3				
6				
9				
12				
15				
18				
21				
24				
27				
0				

Because 0 7 and 24 are in the Horizon, the Nonagesime Degree is continually in 0 6 going equally thro' all the Points of the Horizon, from the left Hand to the Right.

Sir Isaac Newton's Table of Refraction of the Heavenly Bodies. Phil. Transact. No. 368.

Appar. Altir.		Refrac.		Appar. Altir.		Refrac.	
°	'	I	II	°	'	I	II
0	0	33	45	16	3	4	
0	15	30	24	17	2	53	
0	20	27	35	18	2	43	
0	45	25	11	19	2	34	
1	0	23	7	20	2	26	
1	15	21	20	21	2	18	
1	30	19	46	22	2	11	
1	45	18	22	23	2	5	
2	0	17	8	24	1	59	
2	30	15	2	25	1	54	
3	0	13	20	26	1	49	
3	50	11	57	27	1	44	
4	0	10	48	28	1	40	
4	30	9	50	29	1	36	
5	0	9	2	30	1	32	
5	30	8	21	31	1	28	
6	0	7	45	32	1	25	
6	30	7	14	33	1	22	
7	0	6	47	34	1	19	
7	30	6	22	35	1	16	
8	0	6	0	36	1	13	
8	30	5	40	37	1	21	
9	0	5	22	38	1	8	
9	30	5	6	39	1	6	
10	0	4	52	40	1	4	
11	0	4	27	41	1	2	
12	0	4	5	42	1	0	
13	0	3	47	43	0	58	
14	0	3	31	44	0	56	
15	0	3	17	45	0	54	

Sir Isaac Newton's Table of Refraction, continued.

Appar. Altit. °	Refsac.		Appar. Altit. °	Retrac.	
	'	"		'	"
46	0	52	76	0	14
47	0	50	77	0	13
48	0	48	78	0	12
49	0	47	79	0	11
50	0	45	80	0	10
51	0	44	81	0	9
52	0	42	82	0	8
53	0	40	83	0	7
54	0	39	84	0	6
55	0	38	85	0	5
56	0	36	86	0	4
57	0	35	87	0	3
58	0	34	88	0	2
59	0	32	89	0	1
60	0	31	90	0	0
61	0	30			
62	0	28			
63	0	27			
64	0	26			
65	0	25			
66	0	24			
67	0	23			
68	0	22			
69	0	21			
70	0	20			
71	0	19			
72	0	18			
73	0	17			
74	0	16			
75	0	15			

A Table shewing the true Place of the Sun, answering every Degree of Declination.

Declin. Sun.	Sun's Place.
°	° ' "
0	0 0 0
1	2 30 37
2	5 1 28
3	7 32 48
4	10 4 54
5	12 38 2
6	15 12 27
7	17 48 30
8	20 26 31
9	23 6 53
10	25 50 4
11	28 36 34
	♈ ♉ ♊ ♋
12	31 27 4
13	34 22 8
14	37 22 50
15	40 30 17
16	43 45 58
17	47 11 55
18	50 50 56
19	54 47 15
20	59 7 37
	♌ ♍ ♎ ♏
21	64 4 14
22	70 3 56
23	78 40 50
23 29	90 0 0

Note, that these Signs, viz. Aries, Taurus, Gemini, Cancer, Leo, Virgo, are North Declination ;

Libra, Scorpio, Sagittary, Capricorn, Aquarius, Pisces are South Declination.

The greatest, mean, and least daily Motions of ☉ and ☾ are these:

	°	'	"
Sun's	Greatest	1	1 6
	Mean	0	59 8
	Least	0	57 16
Moon's	Great.	15	32 50
	Mean	13	10 35
	Least	11	36 20

The Greatest and least of the ☾ are Variable.

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Moon's Parallax in Altitude,
Longitude, and Latitude.

A

A Table of the Moon's Parallax in Altitude.

The Moon's Horizontal Parallax.

Altit. Moon.	53'		54'		55'		56'		57'	
0	'	"	'	"	'	"	'	"	'	"
0	53	0	54	0	55	0	56	0	57	0
1	52	59	53	59	54	59	55	59	56	59
2	52	57	53	57	54	57	55	57	56	57
3	52	55	53	55	54	55	55	55	56	55
4	52	52	53	52	54	51	55	51	56	51
5	52	48	53	47	54	47	55	47	56	47
6	52	43	53	42	54	41	55	41	56	41
7	52	36	53	36	54	35	55	35	56	34
8	52	29	53	28	54	27	55	27	56	26
9	52	21	53	20	54	19	55	19	56	18
10	52	12	53	10	54	9	55	9	56	8
11	52	2	53	0	53	59	54	58	55	57
12	51	51	52	49	53	47	54	46	55	45
13	51	39	52	37	53	35	54	34	55	32
14	51	26	52	23	53	21	54	20	55	18
15	51	12	52	9	53	7	54	6	55	3
16	50	57	51	54	52	52	53	50	54	27
17	50	41	51	39	52	36	53	33	54	30
18	50	24	51	22	52	18	53	15	54	12
19	50	7	51	4	52	0	52	57	53	53
20	49	48	50	45	51	41	52	37	53	33
21	49	29	50	25	51	21	52	17	53	9
22	49	9	50	5	51	0	51	55	52	44
23	48	47	49	44	50	37	51	33	52	19
24	48	25	49	20	50	14	51	9	52	4
25	48	2	48	56	49	51	50	44	51	39
26	47	38	48	32	49	26	50	19	51	13
27	47	13	48	7	49	0	49	54	50	46
28	46	47	47	41	48	53	49	26	50	19
29	46	21	47	14	48	6	48	58	49	51
30	45	54	46	46	47	38	48	29	49	22

The Table of the Moon's Parallax in Altitude, continued.

The Moon's Horizontal Parallax:

Alejt. Moon.	58'		59'		60'		61'		62'	
0	'	"	'	"	'	"	'	"	'	"
0	58	0	59	0	60	0	61	0	62	0
1	57	59	58	59	59	59	60	59	61	59
2	57	57	58	57	59	57	60	57	61	57
3	57	55	58	55	59	55	60	55	61	55
4	57	51	58	52	59	51	60	51	61	51
5	57	47	58	47	59	46	60	46	61	46
6	57	41	58	41	59	40	60	40	61	39
7	57	34	58	34	59	33	60	33	61	32
8	57	25	58	25	59	25	60	24	61	23
9	57	17	58	17	59	16	60	15	61	14
10	57	07	58	07	59	05	60	04	61	03
11	56	55	57	55	58	54	59	52	60	52
12	56	43	57	42	58	41	59	39	60	39
13	56	31	57	29	58	27	59	26	60	25
14	56	17	57	14	58	12	59	11	60	9
15	56	01	56	59	57	57	58	55	59	53
16	55	45	56	42	57	40	58	30	59	35
17	5	28	56	25	57	22	58	20	59	17
18	55	09	56	06	57	03	58	0	58	57
19	54	50	55	47	56	44	57	40	58	37
20	54	30	55	26	56	23	57	19	58	15
21	54	09	55	05	56	01	56	57	57	53
22	53	46	54	42	55	38	56	33	57	29
23	53	23	54	19	55	14	56	09	57	04
24	52	59	53	54	54	49	55	43	56	38
25	52	34	53	28	54	23	55	17	56	11
26	52	08	53	01	53	55	54	49	55	43
27	51	41	52	34	53	27	54	21	55	15
28	51	13	52	05	52	58	53	51	54	44
29	50	44	51	36	52	28	53	21	54	13
30	50	14	51	06	51	57	52	49	53	41

The Table of the Moon's Parallax in Altitude, continued.

The Moon's Horizontal Parallax.

Altitude. Moon. °	53'		54'		55'		56'		57'	
	'	"	'	"	'	"	'	"	'	"
30	45	54	46	46	47	38	48	29	49	22
31	45	26	46	17	47	08	47	59	48	51
32	44	57	45	47	46	38	47	29	48	20
33	44	27	45	17	46	07	46	57	47	48
34	43	57	44	46	45	36	46	25	47	15
35	43	25	44	14	45	04	45	52	46	41
36	42	52	43	41	44	31	45	18	46	07
37	42	19	43	07	43	56	44	43	45	31
38	41	46	42	33	43	20	44	07	44	55
39	41	11	41	58	42	44	43	31	44	17
40	40	36	41	22	42	08	42	54	43	39
41	40	0	40	45	41	30	42	16	43	0
42	39	23	40	08	40	52	41	37	42	21
43	38	46	39	29	40	13	40	57	41	41
44	38	08	38	50	39	34	40	17	41	0
45	37	29	38	10	38	53	39	36	40	18
46	36	49	37	29	38	12	38	54	39	35
47	36	09	36	49	37	40	38	11	38	52
48	35	28	36	08	36	48	37	28	38	08
49	34	46	35	25	36	05	36	44	37	23
50	34	04	34	42	35	41	35	59	36	38
51	33	21	33	59	34	37	35	14	35	52
52	32	38	33	15	33	52	34	29	35	05
53	31	54	32	30	33	06	33	42	34	18
54	31	09	31	44	32	19	32	55	33	30
55	30	24	30	58	31	32	32	07	32	41
56	29	38	30	11	30	45	31	19	31	52
57	28	52	29	24	29	57	30	30	31	02
58	28	05	28	37	29	08	29	40	30	12
59	27	18	27	48	28	19	28	50	29	21
60	26	30	26	59	27	30	27	59	28	30

The Table of the Moon's Parallax in Altitude, continued.

The Moon's Horizontal Parallax.

Altit. Moon.	58'	59'	60'	61'	62'
"	"	"	"	"	"
30	50 14	51 06	51 57	52 49	53 41
31	49 43	50 04	51 25	52 17	53 07
32	49 11	50 02	50 52	51 44	52 32
33	48 38	49 28	50 18	51 09	51 58
34	48 05	48 54	49 44	50 44	51 23
35	47 30	48 19	49 08	49 58	50 47
36	46 55	47 44	48 32	49 21	50 09
37	46 19	47 07	47 54	48 43	49 30
38	45 42	46 29	47 16	48 04	48 51
39	45 04	45 51	46 37	47 24	48 10
40	44 26	45 12	45 57	46 44	47 29
41	43 46	44 32	45 16	46 02	46 47
42	43 06	43 51	44 35	45 20	46 04
43	42 25	43 09	43 53	44 37	45 20
44	41 43	42 26	43 10	43 53	44 36
45	41 01	41 43	42 35	43 08	43 50
46	40 17	40 59	41 39	42 22	43 04
47	39 33	40 14	40 55	41 36	42 17
48	38 48	39 29	40 08	40 49	41 29
49	38 03	38 42	39 21	40 01	40 40
50	37 17	37 55	38 34	39 13	39 01
51	36 30	37 07	37 45	38 23	39 01
52	35 42	36 19	36 56	37 33	38 10
53	34 54	35 30	36 06	36 42	37 19
54	34 05	34 41	35 16	35 51	36 27
55	33 16	33 50	34 25	34 59	35 34
56	32 26	32 59	33 34	34 06	34 40
57	31 35	32 08	32 41	33 13	33 46
58	30 44	31 16	31 48	32 19	32 51
59	29 52	30 23	30 54	31 25	31 56
60	28 59	29 30	30 00	30 30	31 00

The Table of the Moon's Parallax in Altitude, continued.

The Moon's Horizontal Parallax.

Altit. Moon. °	53'		54'		55'		56'		57'	
	'	"	'	"	'	"	'	"	'	"
60	26	30	26	59	27	30	27	59	28	30
61	25	42	26	10	26	40	27	08	27	38
62	24	53	25	21	25	49	26	17	26	45
63	24	04	24	31	24	58	25	25	25	52
64	23	14	23	40	24	06	24	33	24	59
65	22	24	22	49	23	14	23	40	24	05
66	21	33	21	57	22	22	22	47	23	11
67	20	42	21	05	21	29	21	53	22	16
68	19	51	20	13	20	36	20	58	21	21
69	19	0	19	21	19	43	20	04	20	26
70	18	08	18	28	18	49	19	09	19	30
71	17	16	17	35	17	54	18	14	18	34
72	16	23	16	41	16	59	17	18	17	37
73	15	30	15	48	16	04	16	23	16	40
74	14	37	14	54	15	09	15	27	15	43
75	13	43	13	59	14	14	14	30	14	46
76	12	49	13	04	13	19	13	33	13	48
77	11	55	12	09	12	23	12	36	12	50
78	11	01	11	14	11	26	11	38	11	51
79	10	07	10	19	10	30	10	41	10	53
80	9	12	9	23	9	34	9	44	9	54
81	8	18	8	28	8	37	8	46	8	55
82	7	23	7	32	7	40	7	48	7	55
83	6	29	6	36	6	43	6	50	6	57
84	5	34	5	39	5	46	5	52	5	57
85	4	39	4	43	4	49	4	54	4	58
86	3	43	3	47	3	51	3	55	3	58
87	2	48	2	51	2	54	2	57	2	59
88	1	53	1	55	1	56	1	58	1	59
89	0	59	0	59	0	59	0	59	0	0
90	0	0	0	0	0	0	0	0	0	0

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Moon

The Table of the Moon's Parallax in Altitude, continued.

The Moon's Horizontal Parallax.

Altit. Moon	58'	59'	60'	61'	62'
"	"	"	"	"	"
30	28	59	29	30	31
38	28	07	28	30	30
45	27	15	27	29	29
52	26	20	26	28	28
59	25	25	25	27	27
05	24	30	24	26	26
11	23	35	23	25	25
16	22	39	23	24	24
21	21	43	22	23	23
26	20	47	21	22	22
30	19	50	20	21	21
34	18	53	19	20	20
37	17	55	18	19	19
40	16	57	17	18	18
43	15	59	16	17	17
46	15	1	15	16	16
48	14	2	14	15	15
50	13	3	13	14	14
51	12	3	12	13	13
53	11	4	11	12	12
54	10	4	10	11	11
55	9	3	9	10	10
55	8	2	8	9	9
57	7	5	7	8	8
57	6	4	6	7	7
58	5	4	5	6	6
58	4	5	4	5	5
59	3	3	3	4	4
59	2	2	2	3	3
0	1	1	1	2	2
0	0	0	0	1	1

A Table of the Moon's Parallax in Longitude.

The Moon's Horizontal Parallax.

°	1	2	3	4	5	6
"	"	"	"	"	"	"
0	0	0	0	0	0	0
1	0	1	2	3	4	5
2	0	2	4	6	8	10
3	0	3	6	9	12	15
4	0	4	8	13	17	21
5	0	5	10	16	21	26
6	0	6	13	19	25	32
7	0	7	15	22	29	37
8	0	8	17	25	33	42
9	0	9	19	28	37	47
10	0	11	21	31	42	52
11	0	12	23	34	46	57
12	0	13	25	37	50	1
13	0	14	27	40	54	7
14	0	15	29	44	58	13
15	0	16	31	47	1	18
16	0	17	33	50	6	23
17	0	18	35	53	10	28
18	0	19	37	56	14	33
19	0	20	39	59	18	38
20	0	21	41	1	22	43
21	0	22	43	4	26	47
22	0	23	45	7	30	52
23	0	24	47	10	34	57
24	0	25	49	13	38	2
25	0	25	51	16	41	6
26	0	26	53	19	45	11
27	0	27	54	21	49	16
28	0	28	56	24	53	21
29	0	29	58	27	56	25
30	0	30	1	30	2	30

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°	30
"	31
"	32
"	33
"	34
"	35
"	36
"	37
"	38
"	39
"	40
"	41
"	42
"	43
"	44
"	45
"	46
"	47
"	48
"	49
"	50
"	51
"	52
"	53
"	54
"	55
"	56
"	57
"	58
"	59
"	60

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The Table of the Moon's Parallax in Longitude, continued.

The Moon's Horizonsal Parallax.

0	1		2		3		4		5		6	
	'	"	'	"	'	"	'	"	'	"	'	"
30	0	30	1	0	1	30	2	0	2	30	3	0
31	0	31	1	2	1	32	2	3	2	34	3	5
32	0	32	1	4	1	35	2	7	2	39	3	11
33	0	33	1	5	1	38	2	10	2	43	3	16
34	0	34	1	7	1	41	2	14	2	48	3	21
35	0	35	1	9	1	43	2	17	2	52	3	26
36	0	36	1	11	1	46	2	21	2	56	3	32
37	0	36	1	12	1	48	2	25	3	0	3	37
38	0	37	1	14	1	51	2	29	3	5	3	42
39	0	38	1	15	1	53	2	32	3	9	3	46
40	0	38	1	17	1	56	2	34	3	13	3	51
41	0	39	1	18	1	58	2	37	3	17	3	56
42	0	40	1	20	2	0	2	41	3	21	4	1
43	0	41	1	21	2	2	2	44	3	24	4	5
44	0	42	1	23	2	5	2	47	3	28	4	10
45	0	43	1	25	2	7	2	50	3	32	4	14
46	0	43	1	26	2	9	2	53	3	36	4	19
47	0	44	1	27	2	11	2	55	3	39	4	23
48	0	45	1	29	2	13	2	58	3	43	4	27
49	0	56	1	30	2	15	3	1	3	46	4	31
50	0	46	1	32	2	18	3	4	3	50	4	36
51	0	47	1	33	2	20	3	6	3	53	4	40
52	0	48	1	35	2	22	3	9	3	56	4	44
53	0	48	1	36	2	24	3	11	3	59	4	47
54	0	49	1	37	2	26	3	14	4	3	4	51
55	0	49	1	38	2	27	3	16	4	6	4	54
56	0	50	1	39	2	29	3	19	4	9	4	58
57	0	50	1	40	2	31	3	21	4	11	5	1
58	0	51	1	42	2	33	3	24	4	14	5	5
59	0	51	1	43	2	34	3	26	4	17	5	8
60	0	52	1	44	2	36	3	28	4	20	5	12

The Table of the Moon's Parallax in Longitude and Latitude,
continued.

The Moon's Horizontal Parallax.

0	I	2	3	4	5	6
"	"	"	"	"	"	"
60	0 52	1 44	2 36	3 28	4 20	5 12
61	0 52	1 45	2 38	3 30	4 22	5 13
62	0 53	1 46	2 39	3 32	4 25	5 18
63	0 53	1 47	2 40	3 34	4 27	5 21
64	0 53	1 48	2 42	3 36	4 30	5 24
65	0 54	1 49	2 43	3 37	4 32	5 26
66	0 54	1 50	2 44	3 39	4 34	5 29
67	0 55	1 51	2 45	3 40	4 36	5 31
68	0 55	1 51	2 47	3 43	4 38	5 34
69	0 56	1 52	2 48	3 44	4 40	5 36
70	0 56	1 53	2 49	3 46	4 42	5 38
71	0 56	1 54	2 50	3 47	4 43	5 40
72	0 57	1 54	2 51	3 48	4 45	5 42
73	0 57	1 55	2 52	3 49	4 46	5 44
74	0 57	1 55	2 53	3 51	4 48	5 46
75	0 58	1 56	2 54	3 52	4 49	5 47
76	0 58	1 56	2 55	3 53	4 51	5 49
77	0 58	1 57	2 56	3 54	4 52	5 50
78	0 58	1 57	2 56	3 55	4 53	5 52
79	0 59	1 58	2 57	3 56	4 54	5 53
80	0 59	1 58	2 57	3 56	4 55	5 54
81	0 59	1 59	2 58	3 57	4 56	5 55
82	0 59	1 59	2 58	3 58	4 57	5 56
83	0 59	1 59	2 59	3 58	4 58	5 57
84	1 0	1 59	2 59	3 59	4 58	5 58
85	1 0	1 59	2 59	3 59	4 59	5 58
86	1 0	2 0	3 0	3 59	4 59	5 59
87	1 0	2 0	3 0	4 0	4 59	5 59
88	1 0	2 0	3 0	4 0	5 0	6 0
89	1 0	2 0	3 0	4 0	5 0	6 0
90	1 0	2 0	3 0	4 0	5 0	6 0

*The Table of the Moon's Parallax in Longitude and Latitude;
continued.*

The Moon's Horizontal Parallax.

0	7 "	8 "	9 "	10 "	11 "
0	0 0	0 0	0 0	0 0	0 0
1	0 7	0 8	0 09	0 09	0 11
2	0 15	0 17	0 19	0 19	0 23
3	0 22	0 25	0 28	0 28	0 34
4	0 29	0 33	0 38	0 38	0 46
5	0 36	0 41	0 47	0 47	0 57
6	0 43	0 50	0 56	1 03	1 09
7	0 50	0 58	1 05	1 13	1 20
8	0 58	1 07	1 15	1 23	1 32
9	1 05	1 15	1 24	1 33	1 44
10	1 13	1 23	1 34	1 44	1 55
11	1 20	1 31	1 43	1 54	2 07
12	1 27	1 40	1 52	2 05	2 17
13	1 34	1 48	2 01	2 15	2 28
14	1 42	1 56	2 11	2 25	2 40
15	1 49	2 04	2 20	2 35	2 51
16	1 56	2 12	2 29	2 45	3 04
17	2 03	2 20	2 38	2 55	3 13
18	2 10	2 28	2 47	3 05	3 24
19	2 17	2 36	2 56	3 15	3 35
20	2 24	2 44	3 05	3 25	3 46
21	2 30	2 52	3 13	3 35	3 56
22	2 37	3 0	3 22	3 45	4 07
23	2 45	3 09	3 31	3 54	4 17
24	2 51	3 15	3 40	4 04	4 28
25	2 57	3 24	3 48	4 13	4 38
26	3 04	3 30	3 57	4 23	4 49
27	3 10	3 37	4 05	4 32	4 59
28	3 17	3 45	4 13	4 42	5 10
29	3 23	3 52	4 21	4 51	5 20
30	3 30	4 0	4 30	5 0	5 30

*The Table of the Moon's Parallax in Longitude and Latitude,
continued.*

The Moon's Horizontal Parallax.

0	7	8	9	10	11
	1"	1"	1"	1"	1"
30	3 30	4 0	4 30	5 0	5 30
31	3 36	4 7	4 38	5 9	5 40
32	3 43	4 14	4 46	5 18	5 50
33	3 47	4 21	4 54	5 26	5 59
34	3 55	4 28	5 2	5 35	6 9
35	4 1	4 35	5 9	5 44	6 18
36	4 7	4 42	5 17	5 53	6 28
37	4 13	4 48	5 24	6 1	6 37
38	4 19	4 55	5 31	6 9	6 46
39	4 24	5 2	5 39	6 17	6 55
40	4 30	5 9	5 47	6 26	7 4
41	4 36	5 15	5 54	6 33	7 13
42	4 41	5 21	6 1	6 41	7 22
43	4 46	5 27	6 8	6 49	7 30
44	4 52	5 33	6 15	6 57	7 39
45	4 57	5 39	6 21	7 4	7 47
46	5 2	5 45	6 28	7 12	7 55
47	5 7	5 51	6 34	7 19	8 3
48	5 12	5 57	6 41	7 26	8 11
49	5 17	6 2	6 47	7 33	8 18
50	5 22	6 8	6 54	7 40	8 26
51	5 26	6 13	7 0	7 46	8 33
52	5 31	6 18	7 6	7 53	8 40
53	5 35	6 23	7 11	7 59	8 47
54	5 40	6 28	7 17	8 5	8 54
55	5 44	6 33	7 22	8 11	9 0
56	5 48	6 38	7 28	8 17	9 7
57	5 52	6 42	7 33	8 23	9 13
58	5 56	6 47	7 38	8 29	9 20
59	6 0	6 51	7 43	8 34	9 26
60	6 4	6 56	7 48	8 40	9 32

*The Table of the Moon's Parallax in Longitude and Latitude,
continued.*

The Moon's Horizontal Parallax.

	0	7	8	9	10	11
30	60	6 04	6 56	7 48	8 40	9 32
40	61	6 07	7 0	7 52	8 45	9 37
50	62	6 11	7 4	7 57	8 50	9 43
59	63	6 15	7 7	8 1	8 54	9 48
9	64	6 18	7 11	8 5	8 59	9 53
18	65	6 21	7 15	8 9	9 04	9 58
8	66	6 24	7 19	8 13	9 08	10 03
7	67	6 26	7 22	8 17	9 12	10 07
6	68	6 29	7 25	8 21	9 16	10 12
5	69	6 31	7 28	8 24	9 20	10 16
4	70	6 34	7 31	8 27	9 24	10 20
3	71	6 36	7 34	8 30	9 27	10 24
2	72	6 39	7 37	8 34	9 31	10 28
0	73	6 41	7 39	8 36	9 34	10 31
0	74	6 44	7 41	8 39	9 37	10 35
	75	6 46	7 43	8 41	9 39	10 38
	76	6 48	7 45	8 44	9 42	10 41
	77	6 49	7 47	8 46	9 44	10 43
	78	6 51	7 49	8 48	9 47	10 46
	79	6 52	7 51	8 50	9 49	10 48
	80	6 54	7 53	8 52	9 51	10 50
	81	6 55	7 54	8 53	9 52	10 52
	82	6 56	7 55	8 54	9 54	10 54
	83	6 57	7 56	8 55	9 55	10 55
	84	6 57	7 57	8 56	9 56	10 56
	85	6 58	7 58	8 57	9 57	10 57
	86	6 59	7 59	8 58	9 58	10 58
	87	6 59	7 59	8 59	9 59	10 59
	88	7 0	8 0	8 59	9 59	11 0
	89	7 0	8 0	9 0	10 0	11 0
	90	7 0	8 0	9 0	10 0	11 0

*A Table of the Moon's Parallax in Longitude and Latitude,
continued.*

The Moon's Horizontal Parallax.

0	12	13	14	15	16
0	0 0	0 0	0 0	0 0	0 0
1	0 12	0 13	0 14	0 15	0 16
2	0 25	0 27	0 31	0 31	0 33
3	0 37	0 40	0 47	0 47	0 50
4	0 50	0 54	0 03	1 03	1 07
5	1 02	1 07	1 18	1 18	1 23
6	1 15	1 21	1 28	1 34	1 40
7	1 27	1 35	1 42	1 49	1 57
8	1 40	1 49	1 57	2 05	2 14
9	1 52	2 02	2 11	2 20	2 30
10	2 05	2 15	2 29	2 36	2 47
11	2 17	2 28	2 40	2 51	3 03
12	2 30	2 42	2 55	3 07	3 19
13	2 32	2 55	3 09	3 22	3 35
14	2 54	3 09	3 23	3 38	3 52
15	3 06	3 22	3 37	3 53	4 08
16	3 18	3 35	3 51	4 08	4 25
17	3 30	3 48	4 05	4 23	4 41
18	3 42	4 01	4 19	4 38	4 57
19	3 54	4 14	4 33	4 53	5 12
20	4 06	4 27	4 47	5 08	5 28
21	4 18	4 39	5 01	5 22	5 43
22	4 30	4 52	5 15	5 37	5 59
23	4 41	5 04	5 28	5 51	6 14
24	4 53	5 17	5 42	6 06	6 30
25	5 04	5 30	5 55	6 20	6 45
26	5 16	5 42	6 08	6 34	7 01
27	5 28	5 54	6 21	6 48	7 16
28	5 38	6 06	6 34	7 02	7 31
29	5 49	6 18	6 47	7 17	7 45
30	6 00	6 30	7 00	7 30	8 00

*A Table of the Moon's Parallax in Longitude and Latitude,
continued.*

The Moon's Horizontal Parallax.

	12	13	14	15	16
"	"	"	"	"	"
30	6 0	6 30	7 0	7 30	8 0
31	6 11	6 41	7 12	7 43	8 14
32	6 22	6 53	7 25	7 47	8 29
33	6 33	7 04	7 37	8 10	8 43
34	6 43	7 16	7 50	8 23	8 57
35	6 53	7 28	8 02	8 36	9 10
36	7 03	7 38	8 14	8 49	9 24
37	7 13	7 49	8 25	9 01	9 37
38	7 23	8 0	8 37	9 14	9 51
39	7 33	8 10	8 48	9 26	10 04
40	7 43	8 21	9 0	9 38	10 17
41	7 54	8 31	9 11	9 50	10 29
42	8 02	8 42	9 22	10 02	10 42
43	8 11	8 52	9 33	10 13	10 54
44	8 20	9 02	9 44	10 23	11 07
45	8 29	9 11	9 56	10 36	11 19
46	8 38	9 21	10 04	10 47	11 31
47	8 46	9 30	10 14	10 58	11 42
48	8 55	9 40	10 24	11 09	11 53
49	9 03	9 49	10 34	11 19	12 04
50	9 12	9 58	10 44	11 29	12 15
51	9 19	10 06	10 53	11 39	12 26
52	9 27	10 15	11 02	11 49	12 37
53	9 34	10 23	11 10	11 58	12 47
54	9 42	10 31	11 19	12 08	12 57
55	9 49	10 39	11 27	12 17	13 06
56	9 57	10 47	11 36	12 26	13 16
57	10 04	10 54	11 44	12 34	13 25
58	10 11	11 01	11 52	12 43	13 34
59	10 17	11 08	12 0	12 51	13 42
60	10 24	11 16	12 02	12 59	13 51

Table of the Moon's Parallax in Longitude and Latitude
continued.

The Moon's Horizontal Parallax.

°	12		13		14		15		16	
	'	"	'	"	'	"	'	"	'	"
60	10	24	11	16	12	2	12	59	13	51
61	10	30	11	22	12	12	13	7	13	59
62	10	36	11	29	12	22	13	15	14	8
63	10	42	11	34	12	28	13	22	14	15
64	10	47	11	41	12	35	13	29	14	23
65	10	53	11	49	12	41	13	35	14	30
66	10	58	11	53	12	47	13	42	14	37
67	11	3	11	58	12	53	13	48	14	43
68	11	8	12	3	12	59	13	54	14	50
69	11	12	12	8	13	4	14	0	14	56
70	11	17	12	13	13	9	14	6	15	2
71	11	21	12	17	13	14	14	11	15	7
72	11	25	12	22	13	19	14	16	15	13
73	11	28	12	26	13	23	14	20	15	18
74	11	32	12	30	13	28	14	25	15	23
75	11	35	12	33	13	32	14	29	15	27
76	11	39	12	37	13	36	14	33	15	32
77	11	41	12	40	13	39	14	36	15	35
78	11	44	12	43	13	42	14	40	15	39
79	11	46	12	45	13	44	14	43	15	42
80	11	49	12	48	13	47	14	46	15	45
81	11	51	12	50	13	50	14	48	15	48
82	11	53	12	52	13	52	14	51	15	51
83	11	54	12	54	13	53	14	53	15	53
84	11	55	12	55	13	55	14	55	15	55
85	11	56	12	56	13	56	14	57	15	57
86	11	58	12	58	13	58	14	58	15	58
87	11	59	12	59	13	59	14	59	15	59
88	12	0	13	0	14	0	14	59	15	59
89	12	0	13	0	14	0	15	0	16	0
90	12	0	13	0	14	0	15	0	16	0

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The Table of the Moon's Parallax in Longitude and Latitude
continued.

The Moon's Horizontal Parallax.

	17 "		18 "		19 "		20 "		21 "	
°										
0	0	0	0	0	0	0	0	0	0	0
1	0	17	0	18	0	19	0	21	0	22
2	0	35	0	37	0	40	0	42	0	44
3	0	53	0	56	0	59	1	03	1	06
4	1	11	1	15	1	19	1	24	1	28
5	1	29	1	34	1	39	1	45	1	50
6	1	47	1	53	1	59	2	05	2	12
7	2	04	2	11	2	19	2	26	2	33
8	2	22	2	30	2	39	2	47	2	55
9	2	39	2	48	2	58	3	08	3	17
10	2	57	3	07	3	18	3	28	3	39
11	3	14	3	25	3	37	3	49	4	0
12	3	32	3	44	3	57	4	09	4	22
13	3	49	4	02	4	16	4	29	4	44
14	4	07	4	21	4	36	4	50	5	05
15	4	24	4	39	4	55	5	11	5	26
16	4	41	4	58	5	14	5	31	5	47
17	4	58	5	16	5	33	5	52	6	08
18	5	15	5	34	5	52	6	11	6	29
19	5	32	5	51	6	11	6	30	6	50
20	5	49	6	09	6	30	6	50	7	11
21	6	05	6	26	6	48	7	09	7	31
22	6	22	6	44	7	07	7	29	7	52
23	6	38	7	01	7	25	7	48	8	13
24	6	55	7	19	7	44	8	08	8	32
25	7	11	7	36	8	02	8	27	8	52
26	7	27	7	53	8	20	8	46	9	12
27	7	42	8	10	8	37	9	04	9	31
28	7	57	8	27	8	55	9	23	9	51
29	8	13	8	43	9	12	9	41	10	10
30	8	30	9	0	9	30	10	0	10	30

The

*The Table of the Moon's Parallax in Longitude and Latitude;
continued.*

The Moon's Horizontal Parallax.

°	17		18		19		20		21	
	'	"	'	"	'	"	'	"	'	"
30	8	30	9	0	9	30	10	0	10	30
31	8	45	9	16	9	45	10	18	10	49
32	9	01	9	33	10	05	10	37	11	08
33	9	15	9	48	10	21	10	54	11	26
34	9	30	10	04	10	37	11	11	11	44
35	9	45	10	19	10	52	11	28	12	02
36	10	0	10	35	11	10	11	45	12	21
37	10	14	10	50	11	26	12	02	12	38
38	10	28	11	05	11	42	12	19	12	56
39	10	42	11	19	11	57	12	35	13	13
40	10	56	11	34	12	13	12	51	13	30
41	11	09	11	48	12	28	13	07	13	46
42	11	23	12	03	12	43	13	23	14	03
43	11	36	12	16	12	57	13	39	14	19
44	11	49	12	30	13	02	13	54	14	35
45	12	01	12	43	13	26	14	08	14	50
46	12	14	12	57	13	40	14	23	15	06
47	12	26	13	09	13	53	14	37	15	21
48	12	38	13	22	14	07	14	52	15	36
49	12	49	13	34	14	20	15	04	15	50
50	13	01	13	47	14	33	15	19	16	05
51	13	12	13	59	14	45	15	32	16	19
52	13	24	14	11	14	58	15	46	16	33
53	13	35	14	22	15	10	15	58	16	46
54	13	45	14	34	15	22	16	11	16	59
55	13	55	14	44	15	33	16	23	17	11
56	14	05	14	55	15	45	16	35	17	24
57	14	15	15	05	15	56	16	46	17	36
58	14	25	15	16	16	07	16	58	17	49
59	14	34	15	25	16	17	17	08	18	0
60	14	43	15	35	16	27	17	19	18	11

*The Table of the Moon's Parallax in Longitude and Latitude,
continued.*

The Moon's Horizontal Parallax.

		17	18	19	20	21
		"	"	"	"	"
30	60	14 43	15 35	16 27	17 19	18 11
49	61	14 52	15 44	16 32	17 29	18 22
08	62	15 01	15 54	16 47	17 40	18 33
26	63	15 09	16 2	16 56	17 50	18 43
44	64	15 17	16 11	17 5	17 59	18 53
02	65	15 24	16 19	17 13	18 8	19 2
21	66	15 32	16 27	17 22	18 16	19 11
38	67	15 39	16 34	17 29	18 25	19 20
56	68	15 46	16 41	17 37	18 33	19 28
13	69	15 52	16 48	17 44	18 40	19 36
30	70	15 59	16 55	17 51	18 48	19 44
46	71	16 05	17 1	17 57	18 55	19 51
03	72	16 10	17 7	18 4	19 1	19 58
19	73	16 15	17 12	18 10	19 8	20 5
35	74	16 21	17 18	18 16	19 14	20 1
50	75	16 25	17 23	18 21	19 20	20 17
06	76	16 30	17 29	18 26	19 25	20 23
21	77	16 34	17 33	18 30	19 30	20 28
36	78	16 38	17 37	18 35	19 34	20 32
50	79	16 41	17 40	18 39	19 38	20 37
05	80	16 44	17 43	18 43	19 42	20 41
19	81	16 47	17 46	18 46	19 45	20 45
33	82	16 50	17 49	18 49	19 48	20 48
46	83	16 52	17 52	18 52	19 51	20 51
59	84	16 54	17 54	18 55	19 53	20 53
11	85	16 56	17 56	18 56	19 55	20 55
24	86	16 57	17 57	18 57	19 57	20 57
36	87	16 58	17 58	18 58	19 58	20 58
49	88	16 59	17 59	18 59	19 59	20 59
0	89	17 0	18 0	19 0	20 0	21 0
11	90	17 0	18 0	19 0	20 0	21 0

*A Table of the Moon's Parallax in Longitude and Latitude,
continued.*

The Moon's Horizontal Parallax.

	22		23		24		25		26	
0	'	"	'	"	'	"	'	"	'	"
0	0	0	0	0	0	0	0	0	0	0
1	0	23	0	24	0	25	0	26	0	27
2	0	46	0	48	0	50	0	52	0	54
3	1	09	1	12	1	15	1	19	1	22
4	1	32	1	36	1	40	1	45	1	49
5	1	55	2	0	2	5	2	11	2	16
6	2	18	2	24	2	30	2	37	2	43
7	2	41	2	48	2	55	3	03	3	10
8	3	04	3	12	3	20	3	29	3	37
9	3	27	3	36	3	45	3	55	4	04
10	3	49	4	0	4	10	4	20	4	31
11	4	12	4	24	4	35	4	46	4	58
12	4	34	4	47	4	59	5	12	5	24
13	4	57	5	11	5	24	5	38	5	51
14	5	19	5	34	5	48	6	03	6	17
15	5	42	5	57	6	13	6	28	6	44
16	6	04	6	20	6	37	6	53	7	10
17	6	26	6	43	7	1	7	18	7	36
18	6	48	7	6	7	25	7	43	8	02
19	7	10	7	29	7	49	8	08	8	28
20	7	31	7	52	8	12	8	33	8	53
21	7	53	8	15	8	36	8	58	9	19
22	8	14	8	37	8	59	9	22	9	44
23	8	36	8	59	9	23	9	46	10	09
24	8	57	9	21	9	46	10	10	10	34
25	9	18	9	43	10	9	10	34	10	59
26	9	39	10	5	10	31	10	57	11	24
27	10	0	10	27	10	54	11	21	11	48
28	10	20	10	48	11	16	11	44	12	12
29	10	40	11	10	11	38	12	07	12	36
30	11	0	11	30	12	0	12	30	13	0

*The Table of the Moon's Parallax in Longitude and Latitude,
continued.*

The Moon's Horizontals Parallax.

°	22 "		23 "		24 "		25 "		26 "	
30	11	0	11	30	12	0	12	30	13	00
31	11	20	11	51	12	22	12	53	13	24
32	11	40	12	12	12	44	13	16	13	48
33	11	59	12	42	13	06	13	38	14	10
34	12	18	12	52	13	25	13	59	14	32
35	12	37	13	12	13	46	14	21	14	54
36	12	56	13	31	14	06	14	42	15	17
37	13	15	13	50	14	26	15	04	15	39
38	13	33	14	09	14	46	15	23	16	0
39	13	51	14	28	15	06	15	44	16	22
40	14	08	14	47	15	26	16	04	16	43
41	14	26	15	05	15	45	16	24	17	05
42	14	43	15	23	16	04	16	44	17	24
43	15	0	15	41	16	22	17	03	17	44
44	15	17	15	59	16	40	17	22	18	04
45	15	34	16	16	16	58	17	41	18	23
46	15	50	16	33	17	16	17	59	18	42
47	16	06	16	49	17	33	18	17	19	01
48	16	21	17	05	17	50	18	35	19	19
49	16	36	17	21	18	07	18	52	19	37
50	16	51	17	37	18	23	19	09	19	55
51	17	06	17	53	18	39	19	26	20	12
52	17	20	18	08	18	55	19	42	20	29
53	17	34	18	22	19	10	19	58	20	46
54	17	48	18	36	19	25	20	13	21	02
55	18	01	18	50	19	40	20	28	21	18
56	18	14	19	04	19	54	20	43	21	33
57	18	27	19	17	20	08	21	08	21	48
58	18	39	19	30	20	21	21	12	22	03
59	18	51	19	43	20	34	21	26	22	17
60	19	03	19	55	20	47	21	39	22	31

The Table of the Moon's Parallax in Longitude and Latitude,
continued.

The Moon's Horizontal Parallax.

°	22	23	24	25	26
"	"	"	"	"	"
60	19 03	19 55	20 47	21 39	22 31
61	19 15	20 07	21 00	21 52	22 45
62	19 26	20 19	21 12	22 05	22 58
63	19 37	20 30	21 23	22 17	23 10
64	19 47	20 40	21 34	22 28	23 22
65	19 57	20 51	21 45	22 39	23 34
66	20 06	21 01	21 56	22 50	23 45
67	20 15	21 11	22 06	23 01	23 57
68	20 24	21 20	22 15	23 11	24 06
69	20 32	21 29	22 24	23 21	24 16
70	20 40	21 37	22 33	23 30	24 26
71	20 48	21 45	22 42	23 39	24 35
72	20 55	21 53	22 50	23 47	24 44
73	21 02	22 00	22 57	23 55	24 52
74	21 09	22 07	23 04	24 02	25 00
75	21 15	22 13	23 11	24 09	25 07
76	21 21	22 19	23 18	24 16	25 14
77	21 26	22 25	23 23	24 22	25 20
78	21 31	22 30	23 28	24 27	25 26
79	21 36	22 35	23 33	24 32	25 31
80	21 40	22 39	23 38	24 37	25 36
81	21 44	22 43	23 42	24 41	25 41
82	21 47	22 47	23 46	24 45	25 45
83	21 50	22 50	23 49	24 49	25 48
84	21 53	22 52	23 52	24 52	25 51
85	21 55	22 55	23 54	24 54	25 54
86	21 57	22 57	23 56	24 56	25 56
87	21 58	22 58	23 58	24 58	25 58
88	21 59	22 59	23 59	24 59	25 59
89	21 59	22 59	24 00	25 00	26 00
90	22 00	23 00	24 00	25 00	26 00

*The Table of the Moon's Parallax in Longitude and Latitude,
continued.*

The Moon's Horizontal Parallax.

	27	28	29	30	31
0	0 0	0 0	0 0	0 0	0 0
1	0 28	0 29	0 30	0 32	0 33
2	0 56	0 58	1 0	1 03	1 05
3	1 25	1 28	1 31	1 35	1 38
4	1 52	1 57	2 01	2 06	2 10
5	2 21	2 26	2 32	2 37	2 42
6	2 49	2 55	3 02	3 08	3 14
7	3 18	3 25	3 32	3 39	3 47
8	3 45	3 54	4 02	4 11	4 19
9	4 13	4 23	4 32	4 42	4 51
10	4 41	4 52	5 02	5 13	5 23
11	5 09	5 20	5 32	5 44	5 55
12	5 37	5 49	6 02	6 14	6 26
13	6 05	6 18	6 32	6 45	6 58
14	6 32	6 46	7 01	7 16	7 30
15	6 59	7 15	7 30	7 46	8 02
16	7 26	7 43	7 59	8 16	8 33
17	7 53	8 11	8 28	8 45	9 04
18	8 20	8 39	8 57	9 16	9 35
19	8 47	9 07	9 26	9 46	10 06
20	9 14	9 34	9 55	10 16	10 36
21	9 41	10 02	10 24	10 45	11 06
22	10 07	10 29	10 52	11 14	11 36
23	10 33	10 56	11 20	11 43	12 06
24	10 59	11 23	11 48	12 12	12 36
25	11 25	11 51	12 16	12 41	13 06
26	11 50	12 16	12 43	13 09	13 35
27	12 15	12 43	13 10	13 37	14 04
28	12 40	13 09	13 37	14 05	14 33
29	13 05	13 35	14 04	14 33	15 02
30	13 30	14 0	14 30	15 0	15 30

*The Table of the Moon's Parallax in Longitude and Latitude
continued.*

The Moon's Horizontal Parallax.

°	27 "	28 "	29 "	30 "	31 "
30	13 30	14 0	14 30	15 0	15 30
31	13 55	14 26	14 57	15 27	15 58
32	14 19	14 51	15 23	15 54	16 26
33	14 42	15 15	15 48	16 21	16 53
34	15 5	15 39	16 12	16 47	17 20
35	15 29	15 53	16 38	17 13	17 47
36	15 52	16 27	17 3	17 38	18 13
37	16 15	16 51	17 27	18 3	18 39
38	16 37	17 14	17 51	18 28	19 5
39	16 59	17 37	18 15	18 53	19 31
40	17 21	18 0	18 38	19 17	19 56
41	17 43	18 22	19 1	19 41	20 21
42	18 4	18 44	19 24	20 5	20 45
43	18 26	19 6	19 47	20 28	21 9
44	18 45	19 27	20 9	20 51	21 32
45	19 5	19 48	20 31	21 13	21 55
46	19 25	20 9	20 52	21 35	22 18
47	19 45	20 29	21 14	21 57	22 40
48	20 4	20 48	21 33	22 18	23 2
49	20 23	21 8	21 53	22 40	23 24
50	20 41	21 27	22 13	22 59	23 45
51	20 59	21 46	22 32	23 19	24 7
52	21 17	22 4	22 51	23 39	24 26
53	21 34	22 22	23 9	23 58	24 46
54	21 50	22 39	23 27	24 16	25 5
55	22 7	22 56	23 45	24 34	25 24
56	22 23	23 13	24 2	24 52	25 42
57	22 39	23 29	24 19	25 10	26 0
58	22 54	23 45	24 36	25 27	26 17
59	23 9	24 0	24 52	25 43	26 34
60	23 23	24 15	25 7	25 59	26 51

*The Table of the Moon's Parallax in Longitude and Latitude,
continued.*

The Moon's Horizontal Parallax.

°	27		28		29		30		31	
	'	"	'	"	'	"	'	"	'	"
60	23	23	24	15	25	7	25	59	26	51
61	23	37	24	30	25	22	26	15	27	7
62	23	51	24	44	25	37	26	30	27	22
63	24	04	24	57	25	51	26	44	27	37
64	24	16	25	10	26	4	26	58	27	52
65	24	28	25	23	26	20	27	12	28	8
66	24	40	25	35	26	30	27	25	28	23
67	24	51	25	47	26	42	27	37	28	34
68	25	02	25	58	26	53	27	49	28	45
69	25	12	26	9	27	4	28	1	28	57
70	25	22	26	19	27	15	28	12	29	8
71	25	32	26	29	27	25	28	20	29	19
72	25	41	26	38	27	35	28	32	29	29
73	25	49	26	47	27	44	28	42	29	39
74	25	57	26	55	27	53	28	51	29	48
75	26	05	27	3	28	1	28	59	29	57
76	26	12	27	11	28	9	29	7	30	5
77	26	18	27	17	28	16	29	14	30	12
78	26	24	27	23	28	22	29	21	30	19
79	26	30	27	29	28	28	29	27	30	26
80	26	35	27	34	28	33	29	33	30	32
81	26	40	27	39	28	38	29	38	30	37
82	26	44	27	44	28	43	29	43	30	42
83	26	48	27	48	28	47	29	47	30	46
84	26	51	27	51	28	50	29	50	30	50
85	26	54	27	54	28	53	29	53	30	53
86	26	56	27	56	28	56	29	56	30	55
87	26	58	27	58	28	58	29	58	30	57
88	26	59	27	59	28	59	29	59	30	59
89	27	0	28	0	29	0	30	0	31	0
90	27	0	28	0	29	0	30	0	31	0

*A Table of the Moon's Parallax in Longitude and Latitude,
continued.*

The Moon's Horizontal Parallax.

	32	33	34	35	36
0	0	0	0	0	0
1	0	33	6	35	0
2	1	6	1	9	1
3	1	40	1	44	1
4	2	14	2	18	2
5	2	47	2	53	2
6	3	20	3	27	3
7	3	54	4	2	4
8	4	27	4	36	4
9	5	0	5	10	5
10	5	33	5	44	5
11	6	6	6	18	6
12	6	39	6	51	7
13	7	12	7	25	7
14	7	44	7	59	8
15	8	17	8	33	8
16	8	49	9	6	9
17	9	21	9	39	9
18	9	53	10	12	10
19	10	26	10	45	11
20	10	56	11	17	11
21	11	28	11	49	12
22	11	59	12	21	12
23	12	30	12	53	13
24	13	1	13	25	13
25	13	31	13	57	14
26	14	1	14	28	14
27	14	31	15	0	15
28	15	1	15	29	15
29	15	31	15	59	16
30	16	0	16	30	17

*A Table of the Moon's Parallax in Longitude and Latitude
continued.*

The Moon's Horizontal Parallax.

	32	33	34	35	36
30	16 25	16 30	17 0	17 30	18 0
31	16 29	17 0	17 31	18 2	18 33
32	16 57	17 29	18 1	18 33	19 5
33	17 25	17 58	18 31	19 3	19 38
34	17 53	18 27	19 1	19 33	20 8
35	18 21	18 56	19 30	20 5	20 39
36	18 48	19 24	19 59	20 34	21 10
37	19 16	19 52	20 28	21 4	21 40
38	19 43	20 19	20 56	21 33	22 13
39	20 9	20 46	21 24	22 2	22 39
40	20 34	21 13	21 51	22 30	23 6
41	21 0	21 39	22 18	22 58	23 37
42	21 25	22 5	22 45	23 25	24 5
43	21 50	22 31	23 11	23 52	24 33
44	22 14	22 56	23 37	24 19	25 1
45	22 38	23 20	24 3	24 45	25 28
46	23 1	23 44	24 28	25 11	25 54
47	23 25	24 8	24 52	25 36	26 20
48	23 46	24 31	25 16	26 0	26 45
49	24 9	24 54	25 40	26 25	27 10
50	24 31	25 17	26 3	26 49	27 35
51	24 52	25 39	26 26	27 12	27 59
52	25 13	26 0	26 48	27 35	28 22
53	25 33	26 21	27 9	27 57	28 45
54	25 53	26 42	27 30	28 19	29 7
55	26 12	27 2	27 51	28 40	29 29
56	26 31	27 21	28 11	29 1	29 50
57	26 50	27 40	28 31	29 21	30 11
58	27 08	27 59	28 50	29 41	30 32
59	27 26	28 17	29 9	30 0	30 52
60	27 43	28 35	29 27	30 19	31 11

*A Table of the Moon's Parallax in Longitude and Latitude
continued.*

The Moon's Horizontal Parallax.

°	32		33		34		35		36	
	'	"	'	"	'	"	'	"	'	"
60	27	43	28	35	29	27	30	19	31	11
61	27	59	28	52	29	44	30	37	31	29
62	28	15	29	8	30	1	30	54	31	47
63	28	31	29	24	30	18	31	11	32	5
64	28	46	29	40	30	34	31	28	32	22
65	29	0	29	55	30	49	31	44	32	38
66	29	14	30	9	31	4	31	59	32	53
67	29	27	30	23	31	18	32	13	33	8
68	29	40	30	36	31	32	22	27	33	23
69	29	52	30	49	31	45	32	40	33	37
70	30	4	31	1	31	57	32	53	33	50
71	30	15	31	15	32	9	33	5	34	2
72	30	26	31	23	32	20	33	17	34	14
73	30	36	31	34	32	31	33	28	34	26
74	30	49	31	44	32	41	33	39	34	37
75	30	55	31	53	32	51	33	49	34	47
76	31	3	32	2	33	0	33	58	34	56
77	31	11	32	10	33	8	34	6	35	5
78	31	18	32	17	33	15	34	14	35	13
79	31	24	32	24	33	22	34	21	35	20
80	31	30	32	30	33	29	34	28	35	27
81	31	36	32	36	33	35	34	34	35	33
82	31	41	32	41	33	40	34	40	35	39
83	31	45	32	45	33	45	34	44	35	44
84	31	49	32	49	33	49	34	48	35	48
85	31	52	32	52	33	52	34	52	35	52
86	31	55	32	55	33	55	34	55	35	55
87	31	57	32	57	33	57	34	57	35	57
88	31	59	32	59	33	59	34	59	35	59
89	32	0	33	0	34	0	35	0	36	0
90	32	0	33	0	34	0	35	0	36	0

*The Table of the Moon's Parallax in Longitude and Latitude,
continued.*

The Moon's Horizontal Parallax.

	°	37 "	38 "	39 "	40 "	41 "
0	0	0	0	0	0	0
1	0	39	0	40	0	41
2	1	17	1	19	1	21
3	1	56	1	59	2	2
4	2	39	2	39	2	43
5	3	14	3	19	3	24
6	3	52	3	58	4	4
7	4	31	4	28	4	45
8	5	9	5	17	5	26
9	5	47	5	57	6	6
10	6	25	6	36	6	46
11	7	5	7	15	7	26
12	7	41	7	54	8	6
13	8	19	8	33	8	46
14	8	57	9	12	9	26
15	9	35	9	50	10	6
16	10	12	10	28	10	45
17	10	49	11	6	11	24
18	11	26	11	44	12	3
19	12	3	12	12	12	42
20	12	39	13	0	13	20
21	13	15	13	37	13	58
22	13	51	14	14	14	36
23	14	27	14	51	15	14
24	15	3	15	27	15	52
25	15	38	16	3	16	29
26	16	13	16	39	17	6
27	16	48	17	15	17	42
28	17	22	17	50	18	18
29	17	56	18	25	18	54
30	18	30	19	0	19	30

*The Table of the Moon's Parallax in Longitude and Latitude,
continued.*

The Moon's Horizontal Parallax.

°	37	38	39	40	41
"	"	"	"	"	"
30	18 30	19 0	19 30	20 0	20 30
31	19 4	19 34	20 5	20 36	20 37
32	19 37	20 8	20 40	21 12	21 44
33	20 9	20 42	21 14	21 47	22 20
34	20 41	21 15	21 48	22 22	22 56
35	21 13	21 48	22 11	22 57	23 31
36	21 45	22 20	22 55	23 31	24 6
37	22 16	22 52	23 28	24 4	24 40
38	22 47	23 23	24 0	24 37	25 14
39	23 17	23 55	24 32	25 10	25 48
40	23 47	24 26	25 4	25 43	26 21
41	24 17	24 56	25 35	26 5	26 54
42	24 46	25 26	26 6	26 40	27 26
43	25 14	25 55	26 36	27 18	27 58
44	25 42	26 24	27 6	27 47	28 29
45	26 10	26 52	27 35	28 17	29 1
46	26 37	27 20	28 3	28 47	29 30
47	27 4	27 47	28 31	29 15	29 59
48	27 50	28 14	28 59	29 43	30 28
49	27 56	28 41	26 26	30 11	30 57
50	28 21	29 7	29 53	30 39	31 25
51	28 45	29 52	30 19	31 5	31 52
52	29 9	29 57	30 44	31 31	32 19
53	29 33	30 21	31 9	31 56	32 45
54	29 56	30 44	31 53	32 21	33 10
55	30 18	31 7	31 57	32 45	33 35
56	30 40	31 30	32 20	33 9	33 59
57	31 2	31 52	32 42	33 32	34 23
58	31 23	32 14	33 4	33 55	34 46
59	31 43	32 35	33 26	34 17	35 9
60	32 3	32 55	33 47	34 39	35 31

*The Table of the Moon's Parallax in Longitude and Latitude,
continued.*

The Moon's Horizontal Parallax.

	37		38		39		40		41	
60	32	3	32	55	33	47	34	59	35	31
61	32	22	33	14	34	7	34	59	35	52
62	32	40	33	33	34	26	35	19	36	12
63	32	58	33	51	34	45	35	38	36	32
64	33	16	34	9	35	3	35	57	36	51
65	33	32	34	26	35	21	36	15	37	9
66	33	48	34	43	35	38	36	33	37	27
67	34	3	34	59	35	54	36	49	37	44
68	34	18	35	14	36	10	37	5	38	1
69	34	32	35	29	36	25	37	20	38	17
70	34	46	35	43	36	39	37	35	38	32
71	34	59	35	56	36	53	37	49	38	46
72	35	11	36	9	37	6	38	3	39	0
73	35	23	36	21	37	11	38	15	39	13
74	35	34	36	32	37	30	38	27	39	25
75	35	45	36	44	37	41	38	38	39	37
76	35	55	36	53	37	51	38	49	39	48
77	36	3	37	2	38	0	38	58	39	57
78	36	11	37	10	38	9	39	7	40	6
79	36	19	37	18	38	17	39	15	40	14
80	36	26	37	25	38	24	39	23	40	22
81	36	32	37	32	38	31	39	30	40	29
82	36	38	37	38	38	37	39	37	40	36
83	36	43	37	43	38	42	39	42	40	41
84	36	48	37	47	38	47	39	47	40	46
85	36	51	37	51	38	51	39	51	40	50
86	36	54	37	54	38	54	39	54	40	54
87	36	57	37	57	38	57	39	57	40	57
88	36	59	37	59	38	59	39	59	40	59
89	37	0	38	0	39	0	40	0	41	0
90	37	0	38	0	39	0	40	0	41	0

*A Table of the Moon's Parallax in Longitude and Latitude,
continued.*

The Moon's Horizontal Parallax.

	42		43		44		45		46	
0	0	0	0	0	0	0	0	0	0	0
1	0	44	0	45	0	46	0	47	0	48
2	1	27	1	30	1	32	1	34	1	36
3	2	12	2	15	2	18	2	21	2	24
4	2	56	3	0	3	4	3	8	3	12
5	3	40	3	45	3	50	3	55	4	0
6	4	23	4	29	4	36	4	41	4	48
7	5	7	5	14	5	22	5	29	5	36
8	5	51	5	59	6	7	6	16	6	24
9	6	4	6	44	6	53	7	3	7	12
10	7	17	7	28	7	38	7	49	7	59
11	8	1	8	12	8	24	8	35	8	46
12	8	44	8	56	9	9	9	21	9	33
13	9	27	9	40	9	54	10	7	10	21
14	10	10	10	24	10	39	10	53	11	8
15	10	52	11	8	11	23	11	39	11	55
16	11	34	11	51	12	2	12	24	12	41
17	12	16	12	34	12	51	13	9	13	27
18	12	58	13	17	13	35	13	54	14	13
19	13	40	14	0	14	19	14	39	14	59
20	14	22	14	42	15	3	15	23	15	44
21	15	4	15	24	15	46	16	7	16	29
22	15	44	16	6	16	29	16	51	17	13
23	16	25	16	48	17	12	17	35	17	58
24	17	5	17	29	17	54	18	18	18	42
25	17	45	18	10	18	56	19	1	19	26
26	11	25	18	51	19	17	19	43	20	10
27	19	4	19	31	19	58	20	25	20	53
28	19	43	20	11	20	39	21	7	21	36
29	20	22	20	51	21	20	21	49	22	18
30	21	0	21	30	22	0	22	30	23	0

*The Table of the Moon's Parallax in Longitude and Latitude,
continued.*

The Moon's Horizontal Parallax.

°	42	43	44	45	46
'	"	"	"	"	"
30	21 0	21 30	22 0	22 30	23 0
31	21 38	22 09	22 40	23 11	23 42
32	22 16	22 47	23 19	23 51	24 23
33	23 53	23 14	23 58	24 31	25 30
34	23 29	24 3	24 36	25 10	25 43
35	24 5	24 40	25 14	25 49	26 23
36	24 41	25 16	25 52	26 27	27 2
37	25 16	25 52	26 29	27 5	27 41
38	25 51	26 28	27 5	27 42	28 19
39	26 26	27 3	27 41	28 19	28 57
40	27 00	27 38	28 17	28 55	29 34
41	27 33	28 12	28 52	29 31	30 11
42	28 06	28 46	29 27	30 7	30 47
43	28 39	29 19	30 1	30 42	31 12
44	29 11	29 52	30 34	31 16	31 57
45	29 42	30 24	31 7	31 49	32 32
46	30 13	30 56	31 39	32 22	33 6
47	30 43	31 28	32 11	32 54	33 39
48	31 12	31 57	32 42	33 26	34 11
49	31 42	32 27	33 13	33 57	34 43
50	32 11	32 57	33 43	34 28	35 14
51	32 40	33 28	34 12	34 58	35 46
52	33 8	33 53	34 40	35 28	36 15
53	33 33	34 20	35 8	35 56	36 44
54	33 58	34 47	35 35	36 24	37 13
55	34 24	35 13	36 2	36 51	37 41
56	34 49	35 39	36 28	37 18	38 8
57	35 13	36 4	36 54	37 44	38 35
58	35 37	36 28	37 19	38 10	39 1
59	36 0	36 52	37 43	38 34	39 26
60	36 23	37 15	38 7	38 58	39 50

*The Table of the Moon's Parallax in Longitude and Latitude,
continued.*

The Moon's Horizontal Parallax.

°	42	43	44	45	46
"	"	"	"	"	"
60	36 23	37 15	38 7	38 58	32 50
61	36 44	37 37	38 29	39 21	40 14
62	37 5	37 58	38 51	39 44	40 37
63	37 25	38 20	39 12	40 6	40 59
64	37 45	38 39	39 33	40 27	41 21
65	38 4	38 58	39 53	40 47	41 43
66	38 22	39 17	40 12	41 7	42 2
67	38 40	39 35	40 30	41 25	42 21
68	38 57	39 52	40 48	41 43	42 39
69	39 13	40 8	41 5	42 0	42 57
70	39 28	40 24	41 21	42 17	43 14
71	39 43	40 39	41 36	42 33	43 30
72	39 57	40 54	41 51	42 48	43 45
73	40 10	41 7	42 5	43 2	43 59
74	40 23	41 20	42 18	43 16	44 13
75	40 35	41 32	42 30	43 28	44 26
76	40 46	41 44	42 42	43 40	44 39
77	40 56	41 54	42 53	43 51	44 49
78	41 5	42 3	43 2	44 1	44 59
79	41 13	42 12	43 11	44 10	45 9
80	41 21	42 21	43 20	44 19	45 18
81	41 28	42 28	43 27	44 27	45 26
82	41 35	42 35	43 34	44 34	45 33
83	41 41	42 41	43 40	44 40	45 39
84	41 46	42 46	43 45	44 45	45 45
85	41 50	42 50	43 49	44 49	45 49
86	41 54	42 54	43 53	44 53	45 53
87	41 57	42 57	43 56	44 56	45 56
88	41 59	42 59	43 59	44 59	45 58
89	42 0	43 0	44 0	45 0	45 59
90	42 0	43 0	44 0	45 0	46 0

The Table of the Moon's Parallax in Longitude and Latitude,
continued.

The Moon's Horizontal Parallax.

0	47	48	49	50	51
0	0	0	0	0	0
1	0 49	0 50	0 51	0 52	0 53
2	1 38	1 40	1 42	1 44	1 45
3	2 28	2 31	2 34	2 37	2 40
4	3 17	3 21	3 25	3 29	3 33
5	4 6	4 11	4 16	4 21	4 27
6	4 55	5 1	5 7	5 13	5 20
7	5 43	5 51	5 58	6 5	6 13
8	6 32	6 41	6 49	6 57	7 6
9	7 21	7 31	7 40	7 49	7 59
10	8 10	8 20	8 30	8 41	8 51
11	8 58	9 9	9 22	9 32	9 44
12	9 46	9 58	10 11	10 23	10 26
13	10 34	10 48	11 1	11 15	11 28
14	11 22	11 37	11 51	12 6	12 20
15	12 10	12 25	12 41	12 57	13 12
16	12 57	13 14	13 30	13 47	14 3
17	13 44	14 2	14 19	14 37	14 54
18	14 31	14 50	15 8	15 27	15 45
19	15 18	15 38	15 57	16 17	16 37
20	16 4	16 25	16 45	17 6	17 26
21	16 50	17 12	17 33	17 55	18 16
22	17 36	17 58	18 21	18 43	19 6
23	18 22	18 45	19 9	19 32	19 55
24	19 7	19 31	19 56	20 20	20 44
25	19 52	20 17	20 43	21 8	21 33
26	20 36	21 2	21 29	21 55	22 21
27	21 20	21 47	22 15	22 42	23 9
28	22 4	22 52	23 0	23 28	23 56
29	22 47	23 16	23 45	24 14	24 43
30	23 30	24 0	24 30	25 0	25 30

The Table of the Moon's Parallax in Longitude and Latitude
continued.

The Moon's Horizontal Parallax.

°	47 "	48 "	49 "	50 "	51 "
30	23 30	24 0	24 30	25 0	25 30
31	24 13	24 43	25 14	25 45	26 16
32	24 55	25 26	25 58	26 30	27 2
33	25 36	26 18	26 41	27 14	27 47
34	26 17	26 50	27 24	27 57	28 31
35	26 58	27 32	28 6	28 40	29 15
36	27 38	28 13	28 48	29 23	29 59
37	28 17	28 53	29 29	30 5	30 42
38	28 56	29 31	30 10	30 47	31 24
39	29 35	30 10	30 50	31 28	32 6
40	30 13	30 51	31 30	32 8	32 47
41	30 50	31 29	32 9	32 48	33 28
42	31 27	32 7	32 47	33 27	34 8
43	32 3	32 44	33 25	34 6	34 47
44	32 39	33 21	34 2	34 44	35 26
45	33 14	33 53	34 39	35 21	36 4
46	33 49	34 32	35 15	35 58	36 41
47	34 22	35 6	35 50	36 24	37 18
48	34 55	35 40	36 25	37 9	37 54
49	35 28	36 13	36 59	37 44	38 29
50	36 0	36 46	37 32	38 18	39 4
51	36 51	37 18	38 5	38 51	39 38
52	37 2	37 50	38 37	39 24	40 11
53	37 32	38 20	39 8	39 56	40 43
54	38 1	38 0	39 38	40 27	41 15
55	38 29	39 19	40 8	40 57	41 47
56	38 57	39 47	40 37	41 27	42 16
57	39 25	40 15	41 5	41 56	42 46
58	39 52	40 42	41 33	42 24	43 15
59	40 17	41 8	42 0	42 51	43 43
60	40 42	41 34	42 26	43 18	44 10

*The Table of the Moon's Parallax in Longitude and Latitude,
continued.*

The Moon's Horizontal Parallax.

	47"	48"	49"	50"	51"
60	40 42	41 34	42 26	43 16	44 10
61	41 06	41 59	42 51	43 44	44 36
62	41 30	42 23	43 16	44 09	45 02
63	41 53	42 46	43 40	44 33	45 27
64	42 15	43 09	44 03	44 57	45 51
65	42 37	43 50	44 25	45 19	46 14
66	42 56	43 51	44 46	45 41	46 36
67	43 16	44 11	45 06	46 02	46 57
68	43 33	44 30	45 26	46 22	47 17
69	43 53	44 48	45 45	46 41	47 37
70	44 10	45 06	46 03	46 59	47 56
71	44 26	45 23	46 20	47 16	48 13
72	44 42	45 39	46 36	47 33	48 50
73	44 57	45 54	46 51	47 49	48 46
74	45 11	46 09	47 06	48 04	49 02
75	45 24	46 22	47 20	48 16	49 16
76	45 37	46 33	47 33	48 32	49 30
77	45 48	46 46	47 44	48 43	49 42
78	45 58	46 57	47 55	48 54	49 53
79	46 08	47 07	48 05	49 04	50 03
80	46 17	47 16	48 15	49 14	50 13
81	46 25	47 24	48 23	49 23	50 22
82	46 33	47 32	48 31	49 31	50 30
83	46 39	47 38	48 38	49 37	50 37
84	46 44	47 44	48 44	49 43	50 43
85	46 49	47 49	48 49	49 48	50 48
86	46 53	47 53	48 53	49 52	50 52
87	46 56	47 56	48 56	49 55	50 55
88	46 58	47 58	48 58	49 58	50 58
89	46 59	47 59	48 59	49 59	50 59
90	47 00	48 00	49 00	50 00	51 00

*A Table of the Moon's Parallax in Longitude and Latitude,
continued.*

The Moon's Horizontal Parallax.

	52	53	54	55	56
0	0 0	0 0	0 0	0 0	0 0
1	0 54	0 55	0 57	0 58	0 59
2	1 48	1 50	1 53	1 55	1 57
3	2 43	2 46	2 50	2 53	2 56
4	3 38	3 42	3 46	3 50	3 54
5	4 32	4 37	4 42	4 48	4 52
6	5 26	5 32	5 38	5 45	5 50
7	6 20	6 28	6 35	6 42	6 49
8	7 14	7 23	7 31	7 39	7 47
9	8 8	8 18	8 27	8 36	8 45
10	9 2	9 12	9 22	9 33	9 43
11	9 55	10 7	10 18	10 30	10 41
12	10 48	11 1	11 13	11 26	11 38
13	11 42	11 55	12 9	12 22	12 35
14	12 3	12 49	13 4	13 18	13 32
15	13 28	13 43	13 54	14 14	14 29
16	14 20	14 36	14 53	15 9	15 25
17	15 12	15 29	15 47	16 14	16 22
18	16 4	16 22	16 41	16 59	17 18
19	16 56	17 15	17 35	17 54	18 13
20	17 47	18 7	18 28	18 48	19 8
21	18 38	18 59	19 21	19 42	20 3
22	19 28	19 51	20 13	20 36	20 58
23	20 19	20 42	21 6	21 29	21 52
24	21 9	21 33	21 58	22 22	22 46
25	21 59	22 24	22 49	23 14	23 39
26	22 48	23 14	23 40	24 6	24 32
27	23 36	24 4	24 31	24 58	25 25
28	24 25	24 53	25 21	25 49	26 17
29	25 13	25 42	26 11	26 40	27 9
30	26 0	26 30	27 0	27 30	28 0

*The Table of the Moon's Parallax in Longitude and Latitude,
continued.*

The Moon's Horizontal Parallax.

	52	53	54	55	56
"	"	"	"	"	"
30	26 0	26 30	27 0	27 20	28 0
31	26 47	27 18	27 49	28 20	28 50
32	27 34	28 5	28 37	29 9	29 40
33	28 20	28 52	29 25	29 57	30 29
34	29 5	29 38	30 12	30 45	31 18
35	29 50	30 24	30 58	31 34	32 7
36	30 34	31 9	31 44	32 22	32 55
37	31 18	31 53	32 29	33 7	33 42
38	32 1	32 37	33 14	33 51	34 28
39	32 43	33 21	33 59	34 36	35 14
40	33 25	34 4	34 43	35 24	35 59
41	34 7	34 46	35 26	36 5	36 44
42	34 48	35 28	36 8	36 48	37 28
43	35 28	36 9	36 52	37 31	38 11
44	36 8	36 49	37 31	38 13	38 54
45	36 47	37 29	38 11	38 54	39 36
46	37 25	38 8	38 51	39 34	40 17
47	38 2	38 46	39 29	40 13	40 57
48	38 38	39 23	40 7	40 52	41 36
49	39 14	40 0	40 45	41 30	42 15
50	39 50	40 36	41 22	42 8	42 54
51	40 25	41 11	41 58	42 45	43 31
52	40 59	41 46	42 33	43 21	44 8
53	41 32	42 19	43 7	43 55	44 43
54	42 4	42 52	43 41	44 29	45 18
55	42 35	43 24	44 14	45 2	45 52
56	43 6	43 56	44 46	45 35	46 26
57	43 36	44 28	45 17	46 7	46 58
58	44 6	44 57	45 48	46 39	47 29
59	44 34	45 26	46 17	47 9	47 59
60	45 2	45 54	46 46	47 38	48 29

The Table of the Moon's Parallax in Longitude and Latitude,
continued.

The Moon's Horizontal Parallax.

0	52	53	54	55	56
"	"	"	"	"	"
60	45 2	45 54	46 46	47 38	48 29
61	45 29	46 21	47 14	48 6	48 58
62	45 55	46 48	47 41	48 34	49 27
63	46 20	47 13	48 7	49 0	49 54
64	46 45	47 38	48 32	49 26	50 20
65	47 8	48 2	48 56	49 51	50 45
66	47 30	48 25	49 20	50 15	51 9
67	47 52	48 47	49 42	50 38	51 32
68	48 13	49 9	50 4	51 0	51 54
69	48 33	49 29	50 25	51 21	52 15
70	48 52	49 48	50 45	51 41	52 35
71	49 10	50 7	51 4	52 0	52 55
72	49 27	50 25	51 22	52 19	53 15
73	49 44	50 41	51 39	52 36	53 33
74	50 0	50 57	51 55	52 53	53 50
75	50 14	51 12	52 10	53 8	54 6
76	50 28	51 26	52 25	53 23	54 21
77	50 40	51 38	52 37	53 36	54 34
78	50 52	51 50	52 49	53 48	54 46
79	51 2	52 1	53 0	53 59	54 57
80	51 12	52 11	53 10	54 10	55 7
81	51 21	52 20	53 19	54 19	55 17
82	51 30	52 29	53 28	54 28	55 26
83	51 37	52 36	53 35	54 35	55 34
84	51 43	52 42	53 42	54 42	55 42
85	51 48	52 47	53 47	54 47	55 47
86	51 52	52 52	53 52	54 52	55 52
87	51 55	52 55	53 55	54 55	55 55
88	51 58	52 58	53 58	54 58	55 57
89	51 59	52 59	53 59	54 59	55 59
90	52 0	53 0	54 0	55 0	56 0

*The Table of the Moon's Parallax in Longitude and Latitude,
continued.*

The Moon's Horizontal Parallax.

°	57 "		58 "		59 "		60 "		61 "	
0	0	0	0	0	0	0	0	0	0	0
1	1	0	1	1	1	2	1	3	1	4
2	1	59	2	1	2	3	2	5	2	7
3	2	59	3	2	3	5	3	8	3	11
4	3	58	4	3	4	7	4	11	4	15
5	4	57	5	3	5	9	5	14	5	19
6	5	57	6	3	6	10	6	16	6	22
7	6	57	7	4	7	12	7	19	7	26
8	7	56	8	4	8	13	8	21	8	29
9	8	55	9	4	9	14	9	23	9	32
10	9	54	10	4	10	15	10	25	10	35
11	10	52	11	4	11	15	11	27	11	38
12	11	51	12	3	12	16	12	28	12	40
13	12	49	13	3	13	16	13	30	13	43
14	13	47	14	2	14	16	14	31	14	46
15	14	45	15	1	15	16	15	31	15	48
16	15	42	15	59	16	15	16	32	16	49
17	16	39	16	57	17	15	17	32	17	50
18	17	36	17	55	18	13	18	32	18	51
19	18	33	18	52	19	11	19	32	19	52
20	19	29	19	50	20	10	20	31	20	52
21	20	25	20	46	21	8	21	30	21	51
22	21	21	21	43	22	6	22	28	22	50
23	22	16	22	39	23	3	23	26	23	49
24	23	11	23	35	24	0	24	24	24	48
25	24	5	24	30	24	56	25	21	25	46
26	24	59	25	25	25	52	26	18	26	44
27	25	52	26	19	26	47	27	14	27	41
28	26	45	27	14	27	42	28	10	28	38
29	27	38	28	7	28	36	29	5	29	34
30	28	30	29	0	29	30	30	0	30	30

A Table of the Moon's Parallax in Longitude and Latitude continued.

The Moon's Horizontal Parallax.

°	57		58		59		60		61	
	'	"	'	"	'	"	'	"	'	"
30	28	30	29	0	29	30	30	0	30	30
31	29	22	29	51	30	23	30	54	31	25
32	30	13	30	44	31	16	31	48	32	20
33	31	3	31	35	32	8	32	41	33	14
34	31	52	32	26	32	59	33	33	34	7
35	32	41	33	16	33	50	34	25	34	59
36	33	30	34	5	34	41	35	16	35	51
37	34	18	34	54	35	30	36	6	36	42
38	35	5	35	42	36	19	36	56	37	33
39	35	52	36	30	37	7	37	45	38	23
40	36	38	37	17	37	55	38	34	39	13
41	37	24	38	3	38	42	39	22	40	1
42	38	9	38	49	39	29	40	9	40	49
43	38	53	39	34	40	14	40	55	41	36
44	39	36	40	18	40	59	41	41	42	23
45	40	18	41	1	41	43	42	26	43	8
46	41	0	41	44	42	27	43	10	43	52
47	41	41	42	25	43	9	43	53	44	37
48	42	21	43	6	43	50	44	35	45	20
49	43	1	43	46	44	51	45	17	46	2
50	43	40	44	26	45	12	45	58	46	44
51	44	18	45	5	45	51	46	38	47	24
52	44	56	45	43	46	30	47	17	48	4
53	45	31	46	19	47	27	47	55	48	43
54	46	6	46	55	47	43	48	32	49	21
55	46	41	47	30	48	19	49	8	49	58
56	47	15	48	5	48	54	49	44	50	34
57	47	48	48	38	49	28	50	19	51	9
58	48	20	49	11	50	12	50	53	51	44
59	48	51	49	43	50	34	51	26	52	17
60	49	22	50	14	51	6	51	58	52	50

The Table of the Moon's Parallax in Longitude and Latitude,
continued.

The Moon's Horizontal Parallax.

°	57 "		58 "		59 "		60 "		61 "	
60	49	22	50	14	51	6	51	58	52	50
61	49	51	50	44	51	36	52	29	53	21
62	50	20	51	13	52	6	52	59	53	52
63	50	47	51	41	52	34	53	28	54	21
64	51	14	52	8	53	2	53	56	54	50
65	51	40	52	34	53	28	54	23	55	17
66	52	5	52	59	53	54	54	49	55	44
67	52	28	53	23	54	18	55	14	56	9
68	52	51	53	47	54	42	55	38	56	34
69	53	13	54	9	55	5	56	1	56	57
70	53	34	54	30	55	27	56	23	57	19
71	53	54	54	50	55	47	56	44	57	40
72	54	13	55	10	56	7	57	4	58	1
73	54	31	55	28	56	25	57	23	58	20
74	54	48	55	46	56	43	57	41	58	39
75	55	4	56	2	57	0	57	58	58	56
76	55	19	56	18	57	16	58	14	59	12
77	55	32	56	31	57	29	58	28	59	26
78	55	45	56	44	57	42	58	41	59	40
79	55	57	56	56	57	54	58	53	59	52
80	56	8	57	7	58	6	59	5	60	4
81	56	18	57	17	58	16	59	15	60	14
82	56	27	57	26	58	26	59	25	60	24
83	56	35	57	34	58	33	59	33	60	32
84	56	42	57	41	58	40	59	40	60	40
85	56	47	57	46	58	46	59	46	60	46
86	56	52	57	51	58	51	59	51	60	51
87	56	55	57	55	58	55	59	55	60	55
88	56	58	57	58	58	58	59	58	60	58
89	56	59	57	59	58	59	59	59	60	59
90	57	0	58	0	59	0	60	0	61	0

*The Table of the Moon's Parallax in Longitude and Latitude,
continued.*

The Moon's Horizontal Parallax.

10	62	03	62	73	62
" 0 "	" 1 "	" 2 "	" 3 "	" 4 "	" 5 "
0 0	0 0	30	31 0	60	53 42
1 1	1 4	31	31 56	61	54 13
2 2	2 8	32	32 52	62	54 44
3 3	3 13	33	33 46	63	55 14
4 4	4 18	34	34 40	64	55 44
5 5	5 23	35	35 33	65	56 11
6 6	6 28	36	39 26	66	56 38
7 7	7 33	37	37 18	67	57 3
8 8	8 38	38	38 10	68	57 28
9 9	9 42	39	39 0	69	57 52
10 10	10 46	40	39 50	70	58 16
11 11	11 49	41	40 39	71	58 37
12 12	12 52	42	41 28	72	58 58
13 13	13 56	43	42 16	73	59 17
14 14	15 0	44	43 4	74	59 36
15 15	16 2	45	43 50	75	59 53
16 16	17 4	46	44 36	76	60 10
17 17	18 6	47	45 20	77	60 24
18 18	19 8	48	46 4	78	60 38
19 19	20 10	49	46 47	79	60 50
20 20	21 12	50	47 30	80	61 2
21 21	22 12	51	48 10	81	61 13
22 22	23 12	52	48 50	82	61 24
23 23	24 12	53	49 29	83	61 32
24 24	25 12	54	50 8	84	61 40
25 25	26 11	55	50 45	85	61 46
26 26	27 10	56	51 22	86	61 51
27 27	28 8	57	51 58	87	61 55
28 28	29 6	58	52 34	88	61 58
29 29	30 3	59	53 8	89	61 59
30 30	31 0	60	53 42	90	62 0

A Table of the Sun's Distance from the Vertex of London; to every Degree of Declination N. or S. useful in the Construction of Solar Eclipses.

Sun's Declin. N. & S.	Sun's Decl. Nor.				Sun's Decl. Sou.			
	at Ver.		at		at Ver.		at	
	at Noon	Midni.	at Noon	Midni.	at Noon	Midni.	at Noon	Midni.
0	51	32	51	32	51	32	51	32
1	50	32	52	32	52	32	50	32
2	49	32	53	32	53	32	49	32
3	48	32	54	32	54	32	48	32
4	47	32	55	32	55	32	47	32
5	46	32	56	32	56	32	46	32
6	45	32	57	32	57	32	45	32
7	44	32	58	32	58	32	44	32
8	43	32	59	32	59	32	43	32
9	42	32	60	32	60	32	42	32
10	41	32	61	32	61	32	41	32
11	40	32	62	32	62	32	40	32
12	39	32	63	32	63	32	39	32
13	38	32	64	32	64	32	38	32
14	37	32	65	32	65	32	37	32
15	36	32	66	32	66	32	36	32
16	35	32	67	32	67	32	35	32
17	34	32	68	32	68	32	34	32
18	33	32	69	32	69	32	33	32
19	32	32	70	32	70	32	32	32
20	31	32	71	32	71	32	31	32
21	30	32	72	32	72	32	30	32
22	29	32	73	32	73	32	29	32
23	28	32	74	32	74	32	28	32
23	28	3	75	1	75	1	28	3

A Table of Logarithms for the Correction of the Moon's Variation.

Mean Anomaly of the Sun.							
	Sig. 0.	Sig. 1.	Sig. 2.	Sig. 3.	Sig. 4.	Sig. 5.	
Deg	Logar.	Logar.	Logar.	Logar.	Logar.	Logar.	Deg.
0	0.0242	0.0211	0.0125	0.0004	9.9880	9.9787	30
2	0.0242	0.0207	0.0118	9.9995	9.9872	9.9783	28
4	0.0242	0.0203	0.0110	9.9987	9.9865	9.9779	26
6	0.0241	0.0198	0.0102	9.9978	9.9858	9.9775	24
8	0.0240	0.0193	0.0095	9.9969	9.9851	9.9772	22
10	0.0239	0.0188	0.0087	9.9961	9.9844	9.9769	20
12	0.0237	0.0182	0.0079	9.9952	9.9837	9.9766	18
14	0.0235	0.0177	0.0071	9.9944	9.9830	9.9763	16
16	0.0233	0.0171	0.0063	9.9936	9.9824	9.9760	14
18	0.0231	0.0165	0.0055	9.9928	9.9818	9.9758	12
20	0.0229	0.0159	0.0046	9.9920	9.9812	9.9757	10
22	0.0226	0.0153	0.0038	9.9912	9.9807	9.9755	8
24	0.0223	0.0146	0.0029	9.9904	9.9802	9.9754	6
26	0.0219	0.0139	0.0021	9.9896	9.9797	9.9753	4
28	0.0215	0.0132	0.0012	9.9888	9.9792	9.9753	2
30	0.0211	0.0125	0.0004	9.9880	9.9787	9.9753	0
	Sig. 11	Sig. 10.	Sig. 9.	Sig. 8.	Sig. 7.	Sig. 6.	

THE foregoing Table should have been placed to follow the Table of the Moon's Variation, *Folio 101*. Its Use is, to find the true, or corrected Variation of the Moon. The other shews the Moon's greatest Variation in the Octants, to be 35 Minutes, 10 Seconds: But then that is in the mean Distance of the Sun from the Earth.

The Differences that arise from the Curvature of the *Orbis Magnus*, and the stronger Action of the Sun upon the Moon when Horned and New, than when Gibbous and Full, are allow'd: For by this Table, the greatest Variation in the other Distances of the Sun from the Earth, being in a Proportion compounded of the duplicate Ratio of the time of the Synodical Revolution of the Moon (the time of the Year being given) directly, and the triplicate Ratio of the Sun's Distance from the Earth inversely. Whence Dr. Halley, by this Table, makes the greatest Variation in the Sun's Apogee, 33 Minutes, 16 Seconds; and in his Perigee, 37 Minutes, 13 Seconds; the Eccentricity of the Sun being to the transverse Diameter of the *Orbis Magnus*, as $16\frac{1}{2}$ to 1000.

To find the correct Variation by this Table, the Rule is,

Having found the Variation of the Moon, agreeing to her Distance from the Sun, by the Table, *Folio 101*, reduce the said Variation into Seconds, and then find the Logarithm thereof, as if it was an Absolute Number.

Next, with the Sun's Mean Anomaly, take out of this Table the Logarithm answering thereto; and subtract it from the Logarithm first found; and the Remainder is the Logarithm of the correct Variation, as *per Example*.

In the Example of the Calculation of the Moon's Place, *Folio 88*, the Moon's Variation there is put $32' 49'' = 1969''$.

The Logarithm of 1969" is = 3.294246

With the Sun's Mean Anomaly

$108. 17^{\circ} 46' 35''$, I find, the

Logarithm in the Table to

be subtracted, is

0.0182

Corr. Variation $31' 28'' = 1888''$ Log. 3.276046

Example

Example 2. Suppose the Sun in Perigee, and the Moon distant from the Sun 45 Degrees, being in her Octant. I demand her greatest Variation ?

☾'s Variation per Table, Fol. 101, is $35' 10'' = 2110' \text{ Log. } = 3.24282$

Log. found by ☉ mean Anom, $6^s. 0^o 0' 0''$ is 9.9753

Corr. Variat. of ☾ is $37' 13'' = 2233'' = \text{Log. } = 3.348982$

Note, The Logarithm found by the Sun's mean Anomaly must always be subtracted, and not added. But when (as in the last Example) the Logarithm to be subtracted exceeds the other Logarithm, the Radius must be added, that Subtraction may be performed; as is plain, if the Examples are duly considered.

✍ This and the two last Pages were sent me by a Gentleman unknown (to whom I return my hearty Thanks) being a *Correction* of the Moon's Variation in Page 101; which having diligently perused, and finding it very useful, it merits a Place in this Work.

22 JY63

F I N I S.

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